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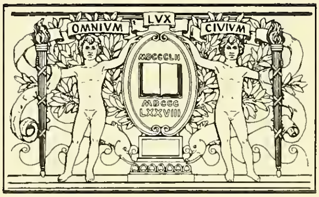

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COURSE OF STUDY
AGRICULTURE

JAMAICA PLAIN HIGH SCHOOL

GRADES IX — X — XI — XII

A PUBLICATION OF THE
BOSTON PUBLIC SCHOOLS
FREDERICK J. GILLIS, PH.D., SUPERINTENDENT

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CITY OF BOSTON

IN SCHOOL COMMITTEE, February 15, 1962

ORDERED, That the accompanying Course of Study, Agriculture, Jamaica Plain High School, Grades IX-X-XI-XII, is hereby adopted, and that three hundred (300) copies be printed as School Document No. 4 - 1962

Attest:

AGNES E. REYNOLDS

Secretary

The School Committee of the City of Boston

1962

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Arthur J. Gartland   William E. O'Connor

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CURRICULUM DIVISION

WILLIAM H. OHRENBERGER, Deputy Superintendent

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STATE-AIDED AGRICULTURAL EDUCATION

Foreword

In 1918 the Boston School Committee established a State-Aided agricultural course at Jamaica Plain High School. The establishment of this course enabled Boston Public School pupils who showed an interest in agriculture and horticulture to continue their education in these fields at the high school level. After completion of the course a graduate may either enter employment or a higher institution of learning such as the Stockbridge School of Agriculture or the College of Agriculture at the University of Massachusetts. The course adheres to State and Federal regulations, thereby making the School Committee eligible for reimbursement for two-thirds of the cost of instruction.

AIMS OF COURSE

The objective of State-aided agricultural education at the high school level is to train properly qualified students for profitable employment and good citizenship. In addition to the principles of secondary school education, it aims to develop specific manipulative skills, technical information, related knowledge, safety, job judgment, and good work habits.

ORGANIZATION

Pupils are admitted who are fourteen years of age and have completed the eighth grade, provided they show an aptitude for this type of education from previous experience or background activities.

Beginning in Grade IX students are expected to be gainfully employed, on a part-time basis, during the school year in some phase of agriculture or horticulture to gain practical experience. During the late spring and summer period a minimum of eleven weeks of full time seasonal employment from June 1 on, in commercial agriculture or horticulture is required.

Placement opportunities must meet the approval of the school and compensation must at least meet the prevailing minimum wage. Upon completion of Grade XII the student is awarded a diploma attesting that he has fulfilled the academic and practice requirements of the course.

CONTENT OF COURSE

The course is divided into the Agricultural Division and the Horticultural Division.

The Agricultural Division has only the agricultural major while the Horticultural Division has two majors, floriculture and landscape gardening. Each major field is further subdivided into two parts, project study and survey study in the classroom.

Agricultural Major

Grade IX - General Agriculture

Grade X - Poultry

Grade XI - Vegetable Gardening

Grade XII - Dairying Manufactures

Floriculture Major

Grade IX - General Agriculture

Grade X - Introductory Horticulture

Grade XI - Floriculture

Grade XII- Landscape Gardening

Landscape Major

Grade IX - General Agriculture

Grade X - Introductory Horticulture or Vegetable Gardening

Grade XI - Landscape Gardening

Grade XII- General Floriculture

The related subjects of Mathematics and Biology are closely correlated with the agricultural or horticultural subjects taught.

The academic program includes subjects necessary to meet diploma points or college entrance requirements espcially English, American History, Civics, Science and Mathematics.

AGRICULTURAL MAJOR

GENERAL AGRICULTURE

GRADE IX

Objectives:

1. To provide definite learning experiences in vegetable gardening, horticulture and dairying
2. To provide experience in agricultural activities that are helpful in classifying the major fields of agricultural study
3. To provide orientation and guidance in the field of agricultural project study

Text: Modern Agriculture
Grimes & Holton - Ginn & Co.
F.B. - Farmers Bulletin
U.O.M. - University of Mass. Leaflet

GENERAL AGRICULTURE

Out of Unit	Suggested Teaching Devices
September	
I. Introduction - Farming - A Challenge,	Text - Chapter I
an Opportunity, and a Vocation	F. Bulletin Farming for
A. Fields of Agriculture	Beginners
B. Progress of Agriculture thru Science	Visit to modern nearby general farm
C. Opportunities in farming	"Careers in Agriculture"
D. Advantages and disadvantages in farming	U.S.D.A. - Land Grant College
II. Improvement and Growth of Food Plants	Text - Chapter II
A. Introduction to principles of plant	The Living Plant - Chart Dia-
growth	grams - General Structure of
B. The living plant body and its work	parts of flowers
C. Absorption by the root	Function of each
D. Food building	
E. Principal substances taken into the	Diagram - Leaf roots and stem
green plant and the uses made of them	Function of each
F. Study of the functions of the roots,	Visit to Arnold Arboretum -
leaves, and stems	Jamaica Plain
G. Study of the flower, pollination and	
fertilization	
October - Corn	Text - Chapter III
III. Corn	Visit to neighboring cornfield
A. Determining the place of corn in	in Fall
the farming program	
B. Preparing the seed bed	
C. Fertilizing	Farmers Bulletin
D. Planting	2073 - Corn
E. Cultivating	Culture
F. Controlling diseases and pests	Study of corn yields

G. Harvesting and ensiling corn	Ford Almanac - 1958 Edition
H. Storing corn	
I. Grading and marketing	
IV. Wheat	Text - Chapter IV
A. Determining the place of wheat in the farming program	Study of wheat yields Ford Almanac - 1958 Edition
B. Preparing the seed bed	
C. Harvesting	
D. Controlling enemies of wheat	
V. Other Small Grains - Oats, Barley, Rye, Rice	
A. Determining the place of the small grains in the farming program	
B. Seed bed preparation	
C. Harvesting	
D. Control of insects and pests	
VI. Hay	Text - Chapter V
A. Determining the place, kind, and acreage in the farming program	University of Massachusetts Bulletin 150 Forage Crops
B. Selecting varieties and securing seed	Visit to nearby dairy farm to observe
C. Preparing the seed bed	
D. Fertilizing, seeding and control of insects	Film Strip - Making Hay
E. Maintaining the growing crop	
F. Harvesting and storing	
November	
VII. Legumes, The Nitrogen Gathering Plants	Text - Chapter VI
A. Determining the importance of growing legumes in the farm program	

B. Analyzing how legumes get nitrogen from the air	
C. Selecting varieties and securing the seed	
D. Studying methods of inoculating the soil	F.B.1496 Inoculation of Legumes
E. Studying the best methods of seeding and harvesting the leguminous varieties of cloves, alfalfa soy beans and other legumes	F.B.1151 Alsike Clover F.B.1339 Red Clover
VIII. Preserving Green Feeds for Winter Use-Silage	Text - Chapter VIII
A. Determining the place of silage in the feeding program for dairy cows	F.B.578 The Making and Feeding of Silage
B. Constructing the silo	F.B.1820 Makes and Types of Silos
C. Problems in measuring the capacity of the silo	Visit to Dairy Farm to study Silos
D. Growing crops for silage	
E. Filling the silo	
IX. Tobacco	Text - Chapter IX
A. Determining the place of tobacco in the farming program	
B. Selecting the variety and securing the seed	F.B. 571 Tobacco Culture
C. Preparing the plant bed and seeding	
D. Fertilizing	
E. Transplanting	
F. Cultivating	
G. Controlling insects and diseases	
H. Topping and suckering	
I. Harvesting	
J. Curing	F.B. 523 Tobacco Curing
K. Preparing and marketing tobacco	

December

X. Potato	Text - Chapter X
A. Determining the place of potatoes in the farming program	
B. Preparing the seed bed	F.B. 1958 Potato Production
C. Fertilizing	
D. Planting	
E. Cultivating	
F. Controlling insects and disease	
G. Harvesting potatoes	
H. Storing	F.B. 1986 Potato Storage
I. Grading and marketing	
XI. Fruit Trees	Text - Chapter XII
A. Determining the place and extent of fruit trees in the farming program	Film strip-Apple Culture
B. Selecting the site	
C. Choosing varieties and buying trees	F.B. 1360 Apple Growing East of Mississippi
D. Preparing land for planting	
E. Laying out the orchard and planting trees	F.B. 42 Varieties of Apples in Mass.
F. Fertilizing	Visit to nearby orchard
G. Cultivating and using cover crops	
H. Training and pruning	
I. Pollinating to insure a set	
J. Controlling disease and pests	
K. Thinning	
L. Picking fruit	
M. Grading and packing	
N. Storing	Visit to cold storage
O. Marketing	Fruit warehouse

XII. Small Fruits	Text
A. Determining the place and extent of small fruits in farming program	U.O.M. Leaflets
B. Selecting the location	29 Strawberry Growing)
C. Choosing varieties and securing plants	48 Raspberry Growing) Mass.
D. Preparing the land for planting	240 Blueberry Growing)
E. Fertilizing	445 Cranberry Growing)
F. Cultivating	
G. Selecting systems of training	
H. Pruning	
I. Controlling diseases and insects	
J. Harvesting and marketing	
K. Mulching and winter protection	
L. Renewing the plant	

January

XIII. Dairying	Pamphlet
A. Planning the dairy farm program	"Better Dairying" - Wirthmore
B. Choosing a breed	Dairy Service Department
C. Selecting the individual	
D. Housing dairy animals	
E. Providing barn and dairy equipment	
F. Testing milk for butterfat	Pamphlet
G. Keeping production records	"Profitable Dairy Management" -
H. Improving the dairy herd and registering animals	Beacon Milling Company
I. Determining whether to use artificial insemination	F.B. 1610 Dairy Farming for Beginners
J. Feeding for milk production	
K. Feeding and care of calves	
L. Caring for cow and calf	

M.	Feeding and caring for the bull	
N.	Dehorning	
O.	Milking	
P.	Controlling diseases and parasites	
Q.	Marketing	
R.	Maintaining sanitary conditions	
XIV.	Poultry	Text - Chapter XXII
A.	Determining the place of poultry in the farming program	
B.	Establishing the flock	Visit to Poultry Show
C.	Brooding and housing the flock	Visit to nearby Poultry Farm
D.	Feeding the growing stock	
E.	Housing and managing the laying flock	U.O.M. Leaflets
F.	Breeding and care of the breeding flock	6 - Poultry Feed
G.	Controlling diseases	35 - Culling & Selecting Hens
H.	Controlling parasites	237 - Chick Production
I.	Marketing eggs	F.B. 2065 Breeds of Chickens
J.	Candling eggs	
K.	Marketing poultry and broilers	
L.	Keeping records	

February

XV.	Beef Cows	
A.	Determining the number and kind of beef cattle in the farming program	Text - Chapter XVIII
B.	Procuring beef cattle	Visit to beef farm
C.	Providing housing and equipment	Visit to Abbattoir - Brighton
D.	Breeding	
E.	Caring for cow and calf at calving	F.B. 612 Breeds of beef cattle
F.	Pasturing	
G.	Feeding beef cattle	

H. Controlling diseases and parasites	
I. Marketing beef cattle	
J. Showing animals	
XVI. Horses	Text - Chapter XVII
A. Determining the number and kind of horses	U.O.M. Horse Production
B. Studying the breeds of both draft and light horses	F.B. 619 Breeds of Draft Horses F.B. 952 Breeds of Light Horses
C. Judging horses	Score card on Judging Horses
D. Feeding horses	
E. Pasturing	Film Strip - Horses and Cattle
F. Controlling disease and parasites	
G. Marketing horses	
XVII. Swine	Text - Chapter XX
A. Determining the place of swine in the farming program	
B. Breeding	
C. Selecting and judging the individual	Score card - Judging Swine
D. Providing houses and equipment	Visit to nearby Piggery
E. Feeding	
F. Care for sow and litter	
G. Controlling disease and parasites	
H. Registering purebred stock	
I. Marketing	
J. Curing pork	
XVIII. Sheep	Text - Chapter XXI
A. Determining the number of sheep in the farming program	
B. Choosing the breed	U.O.M. 179
C. Selecting the individual	Sheep Production
D. Providing housing and equipment	

- E. Feeding
- F. Flushing and breeding
- G. Caring for ewes and lambs during lambing
- H. Docking
- I. Controlling disease and parasites
- J. Shearing
- K. Marketing sheep, lambs, and wool
- L. Fitting and showing animals

March

XIX. Soil

- A. Determining what soil is and how it is made
- B. Analyzing the different kinds of soils
- C. Analyzing the properties of soil and their relation to plant growth
- D. Determining the fertility of soils
- E. Studying commercial fertilizers
- F. Manuring the soil
- G. Rotating the crops
- H. Controlling soil water

Text - Chapter XIV-U.O.M. 64
The Soils of Massachusetts
Pamphlet - Some facts about Massachusetts
U.S. Bulletin #106 Our Productive Land
Ford Almanac 1959 - Gardener's Guide

XX. Home Gardens

Text - Chapter XIII

- A. Determining the vegetables and amounts of each needed for the family
- B. Planning the garden
- C. Selecting the garden location
- D. Selecting varieties
- E. Selecting seeds and plants
- F. Fertilizing, manuring and using cover crops
- G. Constructing, planting and managing the hot bed and cold frame

U.O.M. Leaflet #59 The Home Vegetable Garden
Visit to nearby Commercial Vegetable Farm

H. Planting seed and setting plants	
I. Cultivating	
J. Controlling disease and insects	
K. Exhibiting	U.S. Home & Garden Bulletin
L. Harvesting	#7 Growing Vegetables in Town
M. Storing	or City
N. Grading and marketing	#9 Suburban & Farm Vegetable
April	Garden
XXI. Basic Horticulture	Text - Chapter XIII
A. Starting early vegetables and flower seeds indoors	
B. Testing soils	Film-"Saving the Garden Crop"
C. Sowing seeds	
D. Choosing tools and equipment	
E. Preparing various types of soil	Film strip transplanting Trees
F. Caring of lawns	and Shrubs
G. Caring of perennials and shrubs	
H. Planting and transplanting ornamentals	
I. Thinning plants	
J. Staking plants	
XXII. Application of Business Principles and Practices in Farming	Text - Chapter XXIV
A. Securing a start in farming	
B. Securing funds for farming	
C. Organizing the farm business	
D. Choosing the combination of enterprises	
E. Marketing	
F. Analyzing marketing agencies	
G. Studying "Law of Supply and Demand"	

H. Studying factor affecting above law

I. Keeping records of the farm enterprises and taxes

May

XXIII. Orientation and Guidance

A. Review of general agriculture

B. Products of agriculture in Massachusetts

C. Distribution of agricultural products

D. Value of agricultural products

E. Types of agriculture in Massachusetts

F. Preparation for summer practice

AGRICULTURAL MAJOR

GENERAL POULTRY

GRADE X

Objective:

A general course to give the student fundamental basic training and information in:

Selection of Breeds and Breeding
Incubation, Brooding, Rearing
Disease Prevention and Control
Finishing and Marketing Poultry and
Poultry Products

Text:

"Practical Poultry Management" (6th Ed.)
James E. Rice and Harold E. Botsford
Pub. - John Wiley & Son, Inc., New York, N. Y.

Outline of Unit	Suggested Teaching Devices
September	
I. Shall I Be a Poultryman?	Text - Chapter 22
A. Personal inventory	Have pupils take personal inventory
B. Necessary cash and credit	
C. Limitations of the business	Visit "Field Farm" in Stoughton
D. Special advantages of the business	
E. Methods of getting started	
II. Introduction to the Poultry Business	Information from annual issue of "Farm Finance" published by Federal Reserve Bank, U.S.D.A., Bureau of Agricultural Economics.
A. Total sales in Massachusetts	
B. Total sales in New England	
C. Compare various New England States regarding gross sales	Get new information each year from New England Marketing Service, Atlantic Avenue, Boston
D. Total sales in United States	
E. Compare gross sales with other agricultural products on state, regional and national level	
F. Total layers, broilers and breeders in the United States	
G. Segments of the industry	Mimeograph sheet
III. Selecting the location	
A. Relation to market and transportation	Visit several local farms and score on various points mentioned
B. Soil type	
C. Water and air drainage	

Outline of Unit	Suggested Teaching Devices
October	
IV. Principles of Housing Poultry A. Why house modern hen B. Necessity of pure air C. Temperature D. Air movement E. Siding and walls F. Moisture G. Ventilation H. Types of roofs I. Foundation J. Floor K. Size of flock	Text - Chapter 5 Film - "Poultry Housing" Visit single and multi-deck houses with class for tape survey and sketches "Red Bird Farm", Wrentham, Mass. Wirthmore Booklet - chapter on Housing Principles
V. Housing the Laying and Breeding Stock A. Preparing house for new pullets B. Placing birds in the house C. Constructing a laying house D. Operating house E. Installing poultry house fixtures	Text - Chapter 4 Film - "Poultry House Construction" Poultry House Plans Visit local farms and study types of wood used Wirthmore Booklet - Housing layers Figure capacity of 30 x 40 pen

Outline of Unit	Suggested Teaching Devices
November	
VI. Preparing Poultry and Turkeys	Massachusetts Bulletin -
for Market	"Marketing Farm Poultry"
A. Deciding how to sell	Massachusetts Bulletin - A140
B. Preparing for killing	"Turkey Production"
C. Methods of killing	Show types of knives and ropes
D. Methods of picking	in class
E. Cleaning and cooling the carcass	
F. Drawing	
G. Cutting fowl	
H. Preparing broilers	
I. Preparing poultry for freezer	
J. Caponizing and hormonizing	
December	
VII. Principles of Feeding	Text - Chapter 7
A. Definition of terms	Ralston Purina Booklet
B. Energy value of feeds	"Animal and Poultry Nutrition"
C. Nutrient requirements of chickens	
D. Feeding recommendations	
VIII. Feeding Laying and Breeding Stock	Text - Chapter 6
A. Amount required according to	Pictures of hoppers and automatic
production	feeders
B. Methods of feeding	Bring feed samples to class
C. Use of commercial mixed feeds	Wirthmore Booklet
D. Ingredients of mixed feeds	Bring feed tags and feed bags to
E. Feed tag	class
F. Feed bag analysis	Discuss Feed Inspection Bulletin
G. Feed inspection bulletin	

Outline of Unit	Suggested Teaching Devices
January	
IX. The Art of Knowing Chickens	Text - Chapter 21
A. Parts of a fowl	Show pictures of breeds and varieties of chickens with projector.
B. Shape and location of feathers	
C. Color patterns, comb types, head, shanks and toes	
D. Body shape	Show pictures from American Standard of Perfection with Opaque Projector.
E. Classification of poultry	
F. Important commercial breeds	
G. Poultry and egg shows	
H. Poultry judging	
X. Artificial Illumination	Text - Chapter 9
A. Artificial illumination vs. hen's nature	Visit lighting systems on nearby farms.
B. Principle of artificial illumination	Demonstrate time clock operation in class.
C. Principles of installation	Have class figure light requirements for 30 x 40' pen.
D. Intensity of light	
E. Systems of providing light	
F. Operating the lights	
XI. Anatomy and Physiology of the Domestic Fowl	Text - Chapter 23
A. Feather and feather tracts	Bring New York dressed bird to class and dissect, removing the various systems separately, emphasizing important parts of each system.
B. Head	
C. Nervous system	
D. Muscular system	
E. Respiratory system	
F. Circulatory system	Dr. Salsbury's Laboratories - Chart

Outline of Unit	Suggested Teaching Devices
XI. Anatomy and Physiology (cont.) G. Digestive system H. Excretory system I. Reproductive system J. Skeletal system	Keep specimen under refrigeration and use several days.
XII. Diagnosing and Treating Common Diseases, parasites and pests in Adult Stock A. Examining live bird - external B. Examining dead bird - external and internal C. Check with trained poultry pathologist at laboratory. D. Follow advice and instructions of poultry pathologist. E. Other sources of immediate help - county agent, feed company service man	Text - Chapters 14 and 15 Visit Poultry Diagnostic Laboratory, Waltham Field Station, Waltham, Mass. Beacon Co. booklet - "Profitable Poultry Management"

February

Outline of Unit	Suggested Teaching Devices
XIII. Selecting and Mating Breeders A. Five important characters B. Egg quality C. Pigmentation D. Deciding when to mate breeders E. Number of hens per male F. Methods of mating G. Progeny tested breeders	Text - Chapters 17 and 18 Bring pedigrees to class. Show pictures and charts illustrating inheritance.

Outline of Unit	Suggested Teaching Devices
XIII. Selecting and Mating (cont.) H. Fertility and hatchability I. Pedigree - hatching J. Principles controlling inheritance	Text - Chapters 19 and 20 Show old types of incubators in classroom with opaque projector. Use Cugley, Buckeye and Petersime catalog for modern machines.
XIV. Hatching the Eggs and Renewing the Flock A. Deciding whether to buy or hatch chicks B. Deciding whether to buy sexed chicks C. History of incubation D. Choosing the incubator E. Selecting and caring for hatching eggs F. Operating the incubator G. Cleaning and disinfecting the incubator	Visit Norfolk County Agricultural High School and Farm for study of incubators.
XV. Formation of the Egg and Chick A. Formation of the egg B. Structure of the egg C. Fertilization D. Development of embryo E. Critical periods F. Breaking out of the shell	Text - Chapter 24 Show series of pictures with opaque projector.

Outline of Unit	Suggested Teaching Devices
XVI. Brooding and Feeding Chicks A. Principles of brooding B. Choosing the type of house C. Choosing the type of brooder D. Preparing the house E. Operating the brooder F. Brooding and rearing in confinement	Text - Chapter 1 Bulletin A 63 - Brooding and Rearing Chicks Visit Field Farm and Norfolk County Agricultural High School for study of types of brooders and brooder houses. Use opaque projector and show photographs on file.
March	
XVII. Preparing Eggs for Market A. Producing clean eggs B. Gathering and holding market eggs C. Cleaning market eggs D. Grading and candling market eggs E. U. S. standards for quality eggs F. Massachusetts standards for quality eggs G. Factors affecting interior H. Interior and exterior quality of eggs I. Packing eggs for shipment J. Why eggs lose quality	Text - Chapter 10 Wirthmore Booklet - Chapter on "Eggs and Egg Quality" Visit Brockton Cooperative Grading and Candling Set-up. Collect inferior quality eggs, candle in classroom and break out into white plate for egg quality study.
XVIII. Preventing and Treating Chicks' Diseases and Parasites A. Diagnosing troubles	

Outline of Unit	Suggested Teaching Devices
XVIII. Preventing and Treating (cont.) B. Coccidiosis C. Pullorum D. Newcastle E. Chicken Pox F. Disposal of dead chicks	Text - Chapter 2 Beacon Booklet "Profitable Poultry Management" Dr. Salsbury's Chart - Study infected specimens on field trips.
April	
XVIV. Caring for Young Stock after Brooding A. Confinement rearing B. Range rearing C. Feeding the growing stock D. Importance of constant supply of water E. Providing shelter F. Control of lice and mites	Text - Chapter 3 Bulletin A75 - Range and Laying Shelter Visit growing range at Field Farm and Norfolk County Agricultural High School. Make sketches of range layout and range shelters.
May	
XX. Flock Records A. Keeping the egg record B. Keeping the flock record C. Keeping the brooder record D. Keeping the financial record E. Study the records. F. Cost items G. Factors affecting profits	Text - Chapter 12 and 13 Study of record charts and books from various feed companies

AGRICULTURAL MAJOR

VEGETABLE GARDENING

GRADE XI

This course will cover the fundamentals of growing and marketing of vegetables.

Objectives:

1. To prepare the student for eventually operating a market garden
2. To prepare the student for a foreman's job on a market garden
3. To complete a fundamental part of agricultural training

COURSE OUTLINE

I. General View

Text

"The Vegetable Growing Business"
Watts and Watts

Text - Chapter 1

- A. The term vegetable
- B. Dietary value
- C. Economic importance
- D. Food yield
- E. Types of vegetable growing
  - 1. Production of fresh vegetables for market
    - a. Market gardening
    - b. Truck farming
    - c. Production for processing
    - d. Vegetable forcing
    - e. Home vegetable gardening
    - f. Production of seed
- F. Outlook and opportunities

	Text
II. Locations and Soils	Chapter II
A. Locations	
1. Markets	
2. Transportation facilities	
3. Climate	
4. Topography	
5. Windbreaks	
6. Water supply	
7. Labor supply	
8. Costs of supply	
9. The community	
B. Soils	
1. Importance of suitable soil	
2. Appraising the soil	
3. Adaptation of mineral soils	
4. Muck soils	
III. Seeds	Chapter III
A. Characteristics of good seed	
1. Importance of high vitality	
2. Germination testing	
3. The practical longevity of seeds	
4. Size and weight of seeds in relation to yield	
5. Good breeding in seeds	
6. Freedom from disease	
7. Suitability of seeds for the conditions	

- B. Buying seeds
  - 1. Varieties
  - 2. Novelties
  - 3. Quantities of seeds required
- C. Seed growing
  - 1. Home production of seeds
  - 2. What seeds to produce at home
  - 3. Procedure in home production of seeds
  - 4. Pure lines
  - 5. Cross-pollination in vegetable plants
  - 6. Harvesting, cleaning, and curing
  - 7. Commercial production of vegetable seeds
  - 8. Storage of seed
- D. Seed treatments

IV. Plant Growing — Chapter IV

- A. Uses of glass
- B. Advantages of starting plants under glass
- C. Hotbeds
  - 1. Uses of hotbeds
  - 2. Location and arrangement
  - 3. The pit
  - 4. The frame
  - 5. Sash
- D. Planthouses
  - 1. Advantages of planthouses
  - 2. Uses of planthouses
  - 3. Construction of small houses

- E. Coldframes
    - 1. Uses of coldframes
    - 2. Location, water supply and soil
    - 3. Construction of coldframes
    - 4. Protecting frames from cold
- F. Soil Supply
    - 1. Preparing soil for plant growing
    - 2. Soil disinfection
- G. Containers for Plant Growing
    - 1. Flats or plant boxes
    - 2. Pots and bands
- H. Sowing
    - 1. When to sow
    - 2. Preparing the soil
    - 3. Sowing
    - 4. Care after sowing
    - 5. Damping-off
- I. Transplanting
    - 1. Reasons for transplanting
    - 2. Procedure in transplanting
    - 3. Care after transplanting

V. Management — Chapter V

- A. Planning plantings
- B. Selection of equipment
- C. Arrangement of fields
- D. Soil management and fertilization
- E. Management of labor
- F. Responsibility

- G. Timeliness
- H. Precision
- I. Bookkeeping and accounting
- J. Use of capital
- K. Care of equipment
- L. Management of sales
- M. Cropping systems
  - 1. Crop rotation
  - 2. Succession cropping
  - 3. Intercropping
  - 4. Succession planting
  - 5. Strip cropping

VI. Fertility — Chapter VI

- A. Soil Organic Matter
  - 1. Effects of soil organic matter
  - 2. Nitrogen-carbon ratio
- B. Animal Manures
  - 1. Importance of manures
  - 2. Composition of manure
  - 3. Phosphated manure
  - 4. Characteristics of manures
  - 5. Care of manures
  - 6. Composting manure
  - 7. Time of application
  - 8. Method of application
  - 9. Rate of application

C. Green Manures

  1. Extent and economy
  2. Effects of green manures
  3. Choice of green manure crops
  4. Leguminous green manure crops
  5. Non-leguminous green manures
  6. Planting green manure
  7. Inoculation of leguminous green manure crops
  8. Plowing green manures

D. Use of Lime

  1. Importance of lime
  2. Soil reaction
  3. Acidity tolerance of vegetable crops
  4. Forms of lime
  5. Applying lime

E. Functions of Fertilizers

  1. Importance of fertilizers
  2. Advantages of fertilizers
  3. Balanced fertilization
  4. The use of nitrogen
  5. The use of phosphorus
  6. The use of potassium
  7. Other elements as fertilizers

F. Fertilizer Materials

  1. Nitrogen fertilizers
  2. Phosphorus fertilizers
  3. Potassium fertilizers

G. Complete Fertilizers

  1. Complete fertilizers and concentrations

  2. Fertilizer ratios

  3. Fertilizer formulae

  4. Home mixing of fertilizers

  5. Comparing fertilizer quotations

H. Applying Fertilizers

  1. Rates of application

  2. Methods of application

    a. Row applications

    b. Band placements

I. Typical Fertility Programs

VII. Planting Chapter VII

A. Preparing the Land

  1. Timeliness in preparing soil

  2. Choice of plows and harrows

B. Time and Depth of Plowing

  1. Procedure after plowing

  2. Degree of soil preparation

  3. Adapting soil preparation to the crop and the season

  4. Weed control by soil preparation

  5. Efficiency in preparing the soil

C. Sowing in the Open

  1. Requirements for germination

  2. The moisture supply for germination

  3. When to sow

    4. Quantity of seed to sow
    5. Depth of sowing
    6. Firming the soil

VIII. Cultivation and Weed Control — Chapter VIII

- A. Necessity of weed control
- B. Effects of loosening the soil
- C. Time and frequency of cultivation
- D. Depth of cultivation
- E. Level tillage and hilling
- F. Efficiency in cultivation
- G. Implements and tools used in cultivating
- H. Cultivator attachments
- I. Hoeing and weeding
- J. Thinning
- K. Mulching to control weeds
- L. Special practices for weed control

IX. Irrigation — Chapter IX

- A. Functions of water in the life of plants
- B. Need of irrigation
- C. Benefits of irrigation
- D. Methods of irrigation
    - 1. Sub-irrigation
    - 2. Surface irrigation
    - 3. Porous canvas hose
    - 4. Overhead irrigation
- E. Costs and returns
- F. Permanent or portable systems

G. Water supply

H. Pumping plant

I. When to irrigate

J. How much to irrigate

K. Preparing the system for winter

X. Insects and Diseases — Chapter X

A. Necessity of control

B. Insects and their attacks

C. Vegetable diseases and their causes

D. Preventive and protective measures

E. Corrective measures

F. Insecticides

G. Fungicides

H. Spraying and dusting

I. General crop insects

J. General diseases

XI. Harvesting, Packing and Marketing — Chapter XI

A. Harvesting

1. Timeliness in harvesting

2. Organization in the field

B. Preparation for Market

1. Packing in the field

2. Facilities for packing

3. Washing equipment

4. General procedure

5. Grading

6. Precooling

C. Packing
   1. Use of ice and paper
   2. Waxing
   3. Packages
   4. Packing

D. Transportation
   1. Motor trucks
   2. Transportation by rail
   3. Number of packages to the carload

E. Selling
   1. The grower's responsibility
   2. Sales outlets
   3. Farmers' wholesale markets
   4. Roadside marketing

F. Cooperative Selling
   1. Advantages of cooperative marketing

XII. Storage Chapter XII

A. Recommended Conditions
   1. The main factors to be considered
   2. Temperatures
   3. Humidity
   4. Ventilation
   5. Condition of the crop

B. Types of Storages
   1. The house cellar
   2. Pits, mounds and trenches
   3. Coldframes

    4. Bank storage cellars
    5. Common storage houses
    6. Cold storage

XIII. Cole Crops

Chapter XIII

- A. Cabbage
    1. History
    2. Plant characteristics
    3. Climatic adaptations
    4. Soils
    5. Classification of varieties
    6. Early varieties
    7. Intermediate varieties
    8. Late varieties
    9. Savoy varieties
    10. Red varieties
    11. Seed
    12. Growing early plants
    13. Growing late plants
    14. Sowing where the plants are to mature
    15. Soil preparation
    16. Fertilization
    17. Planting distances
    18. Transplanting in the field
    19. Cultivation
    20. Harvesting
    21. Marketing

22. Storing
23. Yields and returns
24. Sauerkraut
25. Seed growing

B. Insects Attacking Cabbage and Related Crops
    1. Cabbage worms
    2. The cabbage looper
    3. The cabbage aphis
    4. The cabbage root maggot

C. Control in the Seedbed

D. Control in the Field

E. Diseases of Cabbage and Related Crops
    1. Club root
    2. Blackleg
    3. Black rot
    4. Yellows
    5. Root-knot
    6. Wire stem

F. Cauliflower
    1. History
    2. General requirements
    3. Climate
    4. Soil
    5. Varieties
    6. Seed
    7. Growing plants

    8. Fertilizing
    9. Planting
    10. Cultivation
    11. Blanching
    12. Harvesting
    13. Yields
    14. Cold storage

G. Cauliflower Broccoli
    1. Characteristics
    2. Importance
    3. Culture

H. Sprouting Broccoli
    1. Characteristics
    2. Culture
    3. Harvesting
    4. Marketing
    5. Insects and diseases

I. Brussels Sprouts
    1. Characteristics
    2. Culture

J. Chinese Cabbage
    1. Harvesting and storing

K. Kohlrabi
    1. Importance
    2. Culture
    3. Marketing

XIV. Salad Crops

A. Celery

1. History
2. Importance
3. Climatic requirements
4. Soils
5. Classification of varieties
6. Yellow or self-blanching varieties
7. Green varieties
8. Sources of seed
9. Sprouting the seed before planting
10. Growing early plants
11. Growing late plants
12. Manuring
13. Commercial fertilizers
14. Planting
15. Cultivation
16. Mulching
17. Irrigation
18. Blanching
19. Harvesting
20. Packing and marketing
21. Storing
22. Returns
23. Insects
24. Diseases

    25. Early blight
    26. Late blight
    27. Bacterial blight
    28. Bacterial rots
    29. Blackheart
    30. Yellows

B. Lettuce

    1. History
    2. Importance
    3. Climatic requirements
    4. Soil
    5. Varieties
    6. Loose leaf
    7. Crisp head
    8. Butter head
    9. Cos lettuces or Romaine
    10. Seed
    11. Starting early plants
    12. Fertilizing
    13. Setting plants
    14. Sowing in the field
    15. Thinning
    16. Cultivation
    17. Irrigation
    18. Protection from freezing
    19. Harvesting

20. Yields and returns
21. Insects
22. Diseases - Tip - Burn
23. Lettuce Drop
24. Bottom-Rot
25. Downey-mildew
26. Gray Mold-Rot
27. Yellows and Mosaic

C. Parsley
    1. Varieties
    2. Culture

D. Endive
    1. Importance
    2. Varieties
    3. Culture
    4. Blanching

E. Chicory
    1. Field culture
    2. Forcing

F. Cress
    1. Water cress
    2. Garden cress or Pepper grass
    3. Upland cress

G. Corn Salad
    1. Characteristics and uses
    2. Culture

- H. Florence Fennel or Finnochio
  - 1. Culture
- I. Cardoon

XV. Tomatoes, Peppers and Eggplant

Chapter XV

- A. Tomato
  - 1. History
  - 2. Climate
  - 3. Taxonomy
  - 4. Earliana Group
  - 5. Soils
  - 6. Bonny best group
  - 7. Marglobe group
  - 8. Stone group
  - 9. Comet group
  - 10. Pink varieties
  - 11. Hybrid varieties
  - 12. Miscellaneous varieties
  - 13. Seed
  - 14. Starting early plants
  - 15. Starting late plants
  - 16. Southern grown plants
  - 17. Spraying and dusting in the plant bed
  - 18. Soil preparation
  - 19. Fertilizing
  - 20. Planting
  - 21. Cultivation

22. Staked or trellised tomatoes
23. Harvesting
24. Yields and costs
25. Marketing
26. Insects
27. Tomato worm or Horn worm
28. The Fruit worm
29. Diseases
30. Wilt
31. Tomato blights
32. Late blight
33. Early or Alternaria blight
34. Septoria blight or leaf spot
35. Bacteria canker
36. Control program
37. Leaf mold
38. Mosaic
39. Streak
40. Blossom-end rot

B. Pepper

1. History
2. Importance
3. Climatic requirements
4. Soil
5. Taxonomy
6. Varieties

  7. Pungent-fruited varieties
  8. Mild-fruited varieties
  9. Seed
  10. Starting early plants
  11. Fertilizing and planting
  12. Harvesting and marketing
  13. Insects
  14. Pepper maggot
  15. Diseases

C. Eggplant
  1. History and importance
  2. Climatic requirements
  3. Soil
  4. Varieties
  5. Seed
  6. Starting plants
  7. Soil preparation and fertilizing
  8. Planting
  9. Cultivation
  10. Harvesting and marketing
  11. Insects
  12. Diseases
  13. Blight
  14. Wilt

XVI. Bulb Crops

A. Onion

1. History
2. Taxonomy
3. Importance
4. Environmental adaptations and varieties
5. American varieties
6. European varieties
7. Onions propagated vegetatively
8. Seed
9. Soil
10. Soil preparation
11. Fertilizing
12. Growing onions from seed
13. Growing dry sets
14. Pickling onions
15. Growing the crop from sets
16. The transplanting or "green set" method
17. Bunching onions
18. Cultivation
19. Thinning and weeding
20. Irrigation
21. Harvesting and curing
22. Storing
23. Marketing
24. Yields

25. Insects - the onion maggot
26. Onion thrips
27. Diseases - Onion smut
28. Downey-mildew
29. Neck rot
30. Smudge
31. Pink root
32. Yellow dwarf

B. Leek
  1. Importance
  2. Culture

C. Garlic
  1. Culture

D. Shallot

E. Welsh or Japanese Bunching Onion

F. Chive
  1. Character and uses
  2. Culture

VII. Greens — Chapter XVII

A. Spinach
  1. History and importance
  2. Climatic requirements
  3. Soil
  4. Lime requirement
  5. Fertilization
  6. Planting

    7. Cultivation
    8. Harvesting and packing
    9. Varieties
    10. Insects - Spinach aphis
    11. Leaf miner
    12. Diseases - Damping-off
    13. Downey-mildew or leaf mold
    14. Yellows or Mosaic
    15. Malnutrition

B. New Zealand Spinach

C. Dandelion

    1. Importance
    2. Culture

D. Mustard

    1. Importance
    2. Culture

E. Kale or Borecole

    1. History and importance
    2. Varieties
    3. Culture
    4. Planting
    5. Harvesting and marketing

F. Collards

G. Chard or Swiss Chard

    1. Character and uses
    2. Culture

VIII. Root Vegetables

Chapter XVIII

1. Soil requirements
2. Climatic adaptations

A. Beet
   1. History and importance
   2. Soil
   3. Climatic requirements
   4. Fertilization
   5. Seed
   6. Planting
   7. Thinning
   8. Transplanting
   9. Cultivation
   10. Harvesting and marketing
   11. Color
   12. Varieties
   13. Insects - The Leaf Miner
   14. Flea beetles, web worms
   15. Diseases - Leaf Spot
   16. Scab

B. Carrot
   1. History and importance
   2. Climatic requirements
   3. Soil
   4. Fertilization
   5. Seed
   6. Planting

7. Thinning
8. Cultivation
9. Harvesting and marketing
10. Varieties
11. Insects
12. Diseases - Leaf spot and Leaf blight
13. Soft-rot

C. Parsnip

1. Culture

D. Turnip

1. History and importance
2. Soil
3. Climate
4. Sowing
5. Fertilizing
6. Harvesting, marketing and storing
7. Varieties
8. Insects and diseases

E. Rutabaga

1. Culture
2. Harvesting

F. Radish

1. History
2. Importance
3. Cultural requirements
4. Seed

    5. Varieties
    6. The quickly-maturing varieties
    7. Summer varieties
    8. Winter varieties
    9. Marketing
    10. Insects and diseases

G. Horse-radish

    1. History and importance
    2. Uses
    3. Soil
    4. Fertilizing
    5. Propagation
    6. Planting
    7. Cultivation
    8. Stripping
    9. Harvesting and storing
    10. Preparing for market
    11. Insects and diseases

H. Celeriac or Turnip-Rooted Celery

    1. Culture

I. Turnip-Rooted or Hamburg Parsley

J. Salsify

    1. Importance
    2. Culture

XIX. Perennial crops Text

A. Asparagus Chapter XIX

    1. History

2. Plant characteristics
3. Importance
4. Climatic requirements
5. Soils
6. Varieties
7. Producing seed
8. Growing roots or crowns
9. Crown selection
10. Growing versus buying crowns
11. Male versus female plants
12. Soil preparation
13. Lime requirement
14. Manuring
15. Fertilizing
16. Planting distances
17. Planting
18. Intercropping
19. Cultivation
20. Tillage before and after the cutting season
21. Disposal of tops
22. White and green asparagus
23. The harvesting season
24. Cutting the spears
25. Grading and packing
26. Keeping asparagus
27. Crooked spears

28. "Feathering"
29. The age of plantations
30. Insects-The common asparagus beetle
31. The Asparagus miner
32. Cut worms
33. Diseases - Rust

B. Rhubarb

1. History and importance
2. Soil
3. Propagation
4. Varieties
5. Planting
6. Fertilizing
7. Cultivation
8. Duration of the planting
9. Marketing
10. Insects and diseases

C. Globe Artichoke

1. Culture

D. Girasole or Jerusalem Artichoke

1. Uses
2. Culture

XX. Peas and Beans — Text Chapter XX

A. Peas

1. History
2. Climatic requirements

    3. Classification
    4. Canning varieties
    5. Market varieties
    6. Second-early or midseason market varieties
    7. Peas for freezing
    8. Edible-podded peas
    9. Soil preferences and preparation
    10. Fertilizing
    11. Inoculation
    12. Seed treatment
    13. Planting
    14. Cultivation
    15. Supporting the vines
    16. Harvesting
    17. Packing and marketing
    18. Seed production
    19. Insects - The pea aphis
    20. The pea weevil
    21. Diseases

B. Beans

C. Common Beans

    1. Classification according to use
    2. Varietal groups
    3. Varieties
    4. Environmental relationships
    5. Soil selection and preparation

6. Cropping system
7. Liming and fertilizing
8. Planting bush garden beans
9. Planting field or dry-shell beans
10. Planting and supporting pole beans
11. Cultivation
12. Harvesting
13. Seed and seed production
14. Hormone sprays and dusts for snap beans
15. Insects-The Mexican bean beetle
16. Leaf hoppers
17. The seed corn or bean maggot
18. The green clover worm
19. Flea beetles and aphids
20. Diseases
21. Anthracnose
22. Bacterial blight
23. Mosaic
24. Rust
25. Dry root rot
26. Rhizoctonia
27. Powdery mildew
28. Baldhead

D. Lima Beans

1. Culture
2. Varieties

    3. Harvesting
    4. Insects and diseases
    5. Downey-mildew of lima bean
  E. Multiflorus Bean
  F. Broad Bean
  G. Asparagus Bean
    1. The soy bean and the cow pea

XXI. Potato and Sweet Potato — Text, Chapter XXI
  A. Potato
    1. History and importance
    2. Plant characteristics
    3. Climatic adaptations
    4. Soil requirements
    5. Varieties
    6. Rotations
    7. Preparing the seed bed
    8. Good seed
    9. Disinfecting seed
    10. Greensprouting
    11. Warming
    12. Cutting seed
    13. Liming
    14. Fertilizing practices
    15. Planting
    16. Cultivation
    17. Foliage protection

18. Irrigation
19. Harvesting
20. Grading and packing
21. Storing
22. Producing seed potatoes
23. Diseases
24. Late blight
25. Early blight
26. Rhizoctonia
27. Scab diseases
28. Blackleg
29. Wilt
30. Virus diseases as leaf roll, mosaic, yellow dwarf and spindle tuber
31. Insects

B. Sweet Potato

1. History and importance
2. Botanical relationships
3. Climatic requirements
4. Soils
5. Varieties
6. Propagation
7. Selecting seed
8. Disinfecting seed
9. Amount of seed
10. Plant beds
11. Bedding the seed
12. Managing the plant bed
13. Pulling the plants

14. Use of cuttings

15. Rotation

16. Manures

17. Lime

18. Fertilizing

19. Soil preparation

20. Level culture amd ridges

21. Planting

22. Cultivation

23. Harvesting

24. Grading and marketing

25. Storage

26. Insects

27. The sweet potato weevil

28. The sweet potato gold bug

29. Diseases

C. Classification and Description of Sweet-Potato Diseases

XXII. Sweet Corn — Text

A. Sweet Corn — Chapter XXII

1. History and taxonomy

2. Importance

3. Environmental adaptations

4. Rotation and soil preparation

5. Lime

6. Fertilizing

7. Planting

8. Use of plants and plant protectors

9. Cultivating

10. Suckering

11. Harvesting and marketing

B. Seed Growing

1. Production

2. Mass selection

3. Ear-to-row selection

4. Production of hybrid seed

5. The so-called "top-crosses"

C. Varieties

1. First generation hybrids

D. Insects

1. The seed corn maggot

2. The European corn borer

3. Corn earworm

E. Diseases

1. Corn smut

2. Stewart's disease or bacterial wilt

3. Root rots

XXIII. Cucurbits

Text
Chapter XXIII

A. Cucurbits

1. Soil preferences

2. Soil preparation

3. Lime requirement

4. Use of manures

5. Fertilizing
6. Cultivation
7. Pollination
8. Plant growing
9. Plant protectors
10. Forcing boxes
11. Frame culture
12. Irrigation

B. Cucumbers

1. History and importance
2. Adaptations
3. Planting
4. Thinning
5. Harvesting
6. Varieties

C. Muskmelon

1. History and importance
2. Taxonomy
3. Adaptations
4. Soil preparation and fertilizing
5. Planting
6. Thinning
7. Use of plant protectors and forcing boxes
8. Harvesting
9. Marketing
10. Shipping varieties

    11. Local-market varieties
    12. Frame culture

D. Winter Melon

E. Watermelon
    1. History and importance
    2. Adaptations
    3. Culture
    4. Harvesting
    5. Transportation
    6. Varieties

F. Pumpkin and Squash
    1. History
    2. Importance
    3. Classification and varieties
    4. Crossing of Cucurbits
    5. Culture
    6. Harvesting and marketing
    7. Storage
    8. Black Rot

G. Seed of the Cucurbits
    1. Crossing among the Cucurbitaceae
    2. Improvement and breeding
    3. Commercial seed production

H. Insects and Diseases of the Cucurbits

I. Insects Attacking the Cucurbits
    1. Striped cucumber beetle
    2. Twelve-spotted cucumber beetle

        3. Aphis
        4. Pickle worm and melon worm
        5. Squash bug
        6. Squash vine-borer
    J. Diseases Attacking the Cucurbits
        1. Bacterial wilt
        2. Angular leaf-spot
        3. Mosaic
        4. Fusarium Wilt
        5. Control program

XXIV. Okra, Martynia and Herbs

Text

Chapter XXIV

    A. Okra or Gumbo
        1. Culture
    B. Martynia
        1. Culture
    C. Herbs, Condiment and Medicinal plants

XXV. Vegetable Forcing

Text

Chapter XXV

    A. Vegetable Forcing
        1. Forcing boxes
        2. Plant protectors
        3. Frame culture
    B. Greenhouse Construction
        1. The size
        2. Location and position
        3. Types of construction
        4. Semi-iron type of construction

    5. Forms of greenhouses
    6. Walls
    7. Roof construction
    8. Glass
    9. Glazing and painting
    10. Ventilators
    11. Beds, benches and walks
    12. Steam versus hot water heating
    13. The boiler
    14. Radiation
    15. The work room

C. Greenhouse Management

    1. Soils
    2. Manures and fertilizers
    3. Lime
    4. Watering
    5. Temperatures
    6. Mulching
    7. Fumigation

D. Principal Forcing Crops

    1. Lettuce
    2. Radish
    3. Tomato
    4. Cucumber
    5. Rhubarb
    6. Mushroom culture
    7. Solution culture of vegetables
    8. Sand culture

AGRICULTURAL MAJOR

DAIRY TESTING AND MANUFACTURES

GRADE XII

Objectives:

1. To train students in the modern methods of milk handling and the manufacture of dairy products and to show the fundamental practical applications of Bacteriology and Chemistry

2. To familiarize students with the instruments and equipment used in a modern dairy laboratory and with the techniques in handling them

3. To meet the needs of students who are preparing to enter upon the work of "quality control" in the processing, handling and manufacture of milk and milk products

Text:

"The Principles of Dairying"
Judkins and Mack - John Wiley & Sons - March 1955

Reference Text:

"Market Milk"
Kelly & Clement - John Wiley & Sons

Outline of Unit	Suggested Teaching Devices
September	
I. General Scope of the Dairy Industry	Text: Chapter I
A. Determining the extent of the dairy industry	"Handbook of Dairy Statistics U.S.D.A." - Milk Facts - 1957
B. Reviewing the origin and characteristics of the leading dairy breeds	Show pictures of breeds, records of production U.S.D.A. F.B. 1443 Breeds Make Charts - How the U.S. Milk Supply is Used (Milk Industry Foundation U.S.D.A. Yearbook)-
C. Production and uses of milk	
D. Studying and analyzing the many branches of the dairy industry.	Production and Uses of Milk Listing Opportunities 1. Production of Milk 2. Handling of Milk 3. Manufacture of Milk Products - U.S.D.A. Bulletin and Judkins - "Dairy Field As An Opportunity"
E. Analyzing the advantage versus disadvantage of dairying	
F. Analyzing the opportunities in the fields of animal husbandry and dairying	
II. Studying and Analyzing the Secretion of Milk and Conditions Affecting Secretion	Chapter II Text
A. Diagraming the cow's udders and labeling the same	"The Structure of the Cow's Udder" - Mo. Agr. Exp. Bul. 344 by C. W. Turner
B. Analyzing the complete make-up of the cow's udder	
C. Analyzing how milk is made	Pamphlet - "A Build-up for a Let-Down" - Diagrammatic story of both internal and external parts and functions of the udder.
D. Analyzing the conditions affecting milk secretion	
E. Improving cows through the studies and advantages of the Dairy Herd Improvement Association	

October

III. Composition and Properties of Milk	Text - Chapter III - "Milk Facts"
A. Defining milk and its constituents	"Milk Industry Foundation" - 1957 Edition
B. Charting the average composition of milk of various animals	Text - Charts
C. Studying the different variations in the composition of cow's milk	Text - Charts
D. Grouping the milk constituents	
E. Determining the properties	
F. Analyzing the constituents and their uses	
G. Testing by means of problems, the percentage of the different constituents found in milk - changing quarts to pounds, composition of dairy products	Text - Modern Agriculture Mathematics - Nadler - Chapter XIII - Orange - Judd
IV. Factors Affecting the Composition of Milk and Butterfat	Text-Chapter IV
A. Analyzing nineteen factors affecting or changing composition	
B. Charting the lactation (one year) period of the four leading breeds of cows	Charts and graphs made in class exercises
C. Charting the fat content (one year) period of the four leading breeds of cows	
D. Figuring and comparing milk production and butterfat yields of the four leading dairy breeds	Problems - Math Problems - Agricultural Math Book

November

V. Sampling Milk and Cream	Text Chapter V
A. Obtaining a correct sample	
B. Taking composite samples	
C. Using preservatives	Visit to nearby Dairy Plant
D. Caring and testing composite samples	
E. Sampling and testing of milk at the city milk plant	Testing samples as class procedure Demonstration in technique
F. Figuring and completing problems in fundamentals	
1. No. of pounds of butterfat in dairy products	
2. Finding tests of dairy products	Problems - Pearson Method of Standardizing milk and cream
3. Examining general butterfat problems-application to both the farm and milk plant	Agricultural Math Book
VI. Sampling Cream	
VII. Babcock Test for Milk Products	
A. Obtaining and testing skim milk	Visits to three outstanding dairy plants - laboratories
B. Obtaining and testing buttermilk	
C. Obtaining and testing cheese	
D. Obtaining and testing evaporated milk	
E. Obtaining and testing condensed milk	
F. Obtaining and testing ice cream	
VIII. Outlining the Steps in the Babcock Test for All Milk Products	Text - Chapter VI
A. Analyzing conditions before the invention of the test	Pamphlet - Manual for Milk and Cream Testers in Massachusetts - January 1956

B. Studying the different advantages and disadvantages of the Babcock Test

C. Outlining for future references the steps in the Babcock Test for the different milk products

Text - Chapter VII

D. Checking the defects under different conditions

E. Cleaning and storing utensils

F. Testing by means of problems the values and results of the Babcock Test

December

IX. Testing Milk for Total Solids - Not Fat and Specific Gravity

Text - Chapter VIII

Demonstrations with Quevenne and New York State Board of Health - Lactometers in class

A. Determining the total solids and solids not fat found in milk

B. Outlining the needs and State and Federal requirements of the above test

Problems - Finding Total Solids, Solids Not Fat, Specific Gravity of Milk and Milk Problems

C. Outlining for future references the steps in the test

D. Analyzing the common factors affecting the weight and volume of milk

Charts --Relation of fat to other solids in milk

E. Operating the test using the Quevenne lactometer

Reference Material: "Standard Methods of Milk Analysis"

F. Operating the test using the N. Y. Board of Health Lactometer

G. Calculating by means of problems the arithmetical significance of the tests

H. Identifying different adulterated samples of milk

I. Calculating and testing problems dealing with T.S.; SNF and Sp. Gra.

X. Sampling Milk for Acidity	Text - Chapter X
A. Determining the causes of acidity in milk	
B. Outlining the needs and requirements of the test	Class - Demonstration Titration
C. Operating the test using Mann's formula	Acid vs. Alkaline plus Salts
D. Operating the test using Farrington's formula	
E. Grading milk and cream with the rapid acid test	
F. Calculating by means of problems and use of formulae the values and results by arithmetical tests	

January

XI. The Bacteriology of Milk

- A. Studying the different types of bacteria in milk
- B. Growing bacteria under different conditions and factors
- C. Analyzing and studying the marphology of bacteria
- D. Grouping the different types of bacteria found in milk both harmful and beneficial
- E. Outlining the steps in the operation of the Plate Count Method for Bacteria
- F. Outlining the steps in the operation of the Breed or Microscopic Method
- G. Outlining the steps in the operation of the Methylene Blue Test

Reference Materials

1. Standard Methods for Examination of Dairy Products - Seventh American Public Health Assn., N.Y.
2. Milk Ordinance and Code: U.S. Public Health Service
3. Dairy Bacteriology - B.W. Hammer; Pub. John Wiley & Co.
4. Visit to nearby milk plant laboratory for professional demonstration and observation of bacteria test

H. Selecting the factors responsible for the contamination of milk by bacteria - utensils, etc.	
I. Determining the extent and reason of different types of abnormal milk	
XII. Keeping Milk and Butterfat Records	Class examination of milk charts, breeding and cow record forms used in Dairy Herd Improvement, work examination of test, Supervisors' reports for Advance Registry
A. Analyzing the reasons and values obtained in keeping above records	
B.. Keeping milk records	
C. Keeping breeding records	
D. Evaluating and interpreting such records	
E. Keeping advanced registry and D.H.I.A. records	
F. Studying the records kept by both of the above associations	
G. Calculating by means of problems practical records kept on the farm	
February	
XIII. Producing and Handling Market Milk on the Farm	Class demonstration of judging and scoring milk and cream
A. Judging and scoring milk and cream	
B. Correlating the above points to conditions found on the farm	Use of score card for judging dairy barns
C. Judging and scoring a dairy barn using Massachusetts standards	Visit to nearby dairy farm to observe the process of handling milk
D. Laying out plans for a dairy house	

E. Milking cows	
F. Using milking machines versus hand milking	
G. Cleaning and washing milking machines	
H. Removing and straining milk	
I. Cooling milk	
J. Constructing cooling tanks	
K. Preparing the milk for sale	
L. Calculating by means of practical problems the weighted average of butterfat and volume	
M. Bottling milk	
N. Cleaning equipment	
XIV. Storing and Transporting Milk from Farm to the Milk Plant	Storing and transporting milk Visit to nearby large milk plant
A. Selling wholesale to the city plant	
B. Handling the milk at the city plant	
C. Grading milk	
XV. Pasteurizing the Milk	Pasteurizing Milk
A. Outlining the steps in pasteurizing milk by the different methods	Text - Chapter XIII
B. Holding method	
C. Flash method	
D. Electrical method	
E. In-the-bottle method	

	F. Studying methods employed in the handling of surplus milk G. Testing by means of problems rates paid for different grades of milk - by volume - on butter-fat percentage - New England & Boston prices	
XVI.	Studying the Food Values of Milk A. Evaluating and analyzing the caloric and energy content of milk and milk products B. Studying the different vitamins found in milk and milk products and their values to the consumer	Food Values of Milk Text - Chapter XIX
XVII.	Separating Cream - (Separation) A. Evaluating the methods used before the invention of the modern separator B. Drawing and studying the course of milk thru a separator C. Naming the parts of a separator D. Studying the different types as to advantages and disadvantages E. Caring for the separator F. Adjusting and assembling the separator G. Regulating the cream screw H. Cleaning and washing the separator I. Standardizing milk and cream by means of practical problems	Drawing and labeling parts of a separator Problems: Review of Standardization Problems in amounts of cream made from milk Per cent of cream made from whole milk Amounts of skim milk Per cent of loss of Butter-fat in skim milk

J. Studying the factors affecting the richness of cream and the losses of butterfat in skim milk

XVIII. Butter Making

A. Selecting the churn

B. Preparing the cream for buttermaking

C. Churning the cream

D. Studying the factor affecting the length of churning

E. Washing the butter

F. Working the butter

G. Packing the butter

H.. Marketing the butter

I. Calculating by means of problems, values and percentages with their overruns

XIX. Ice Cream Making

Visit to nearby Ice Cream Company

Problems - Making the Mix - Percentage of ingredients and standardizing the products

A. Determining the extent of the ice cream industry

B. Classifying ice cream

C. Judging and scoring ice cream for quality and defects

D. Analyzing ice cream for its ingredients

E. Processing ice cream

F. Standardizing ice cream

G. Pasteurizing ice cream

H. Homogenizing ice cream

I. Aging and storing ice cream	
J. Freezing, hardening, and storing ice cream	
K. Ices and sherbets (processing)	
XX. Cheese Making	Text - Chapter XVII
A. Understanding the fundamentals in cheese making	
B. Cheese making at home	
C. Cheese making commercially	
D. Marketing cheese	
E. Processing different types of cheese	
F. Storing cheese	
G. Calculating by means of practical problems, weights, values, and percents of cheese.	
XXI. Sterilizing and Cleaning Utensils	Text - Chapter XII
A. Handling and cleaning utensils on the farm	
B. Handling and cleaning utensils in the plant	
C. Sterilizing and cleaning vats, pasteurizers, separators, and clarifiers	
D. Mixing and using Sodium Hypochlorites	
E. Preparing Chlorammie "T" solutions	
F. Controlling bacterial counts by means of chemicals	

	G. Calculating by means of practical problems amounts, volumes, and strengths of chemicals	
XXII.	Studying and Analyzing the Requirements and Laws Pertaining to the Production of Different Grades of Milk	Laws governing the processing and sale of milk in the state of Massachusetts
	A. Selecting the standards of grades acceptable in New England and Massachusetts	
	B. Studying and analyzing the laws pertaining to license to sell, pasteurization requirements, types of pasteurizers, etc.	
XXIII.	Refrigeration	Refrigeration Ref. "Market Milk" - Kelly and Clement
	A. Cooling the milk on the farm	Chapter XXII - Pages 373-382
	B. Cooling the milk in the plant	Visit to nearby milk plant
	C. Breaking down and analyzing the different freezing processes	
	D. Selecting an aerator	
	E. Making a brine solution	
	F. Analyzing an ammonia system	
	G. Storing milk in a refrigerator	
XXIV.	Lay-out of the Dairy Plant	"Market Milk" - Kelly and Clement Chapter XVI
	A. Equipping the city milk plant	Pages 237-275 - Floor Plans
	B. Planning the receiving room	Visit to nearby milk plant
	C. Planning the bottling space	
	D. Planning the pasteurizing room	
	E. Planning the loading platform	
	F. Planning the office and drivers' room	
	G. Laying out the complete plant on paper	

XXV. Marketing Dairy Products

- A. Marketing the different types of manufactured milk products
- B. Analyzing and projecting the general market conditions
- C. Marketing and figuring the cost of distributing milk in large cities
- D. Marketing through Producer's Cooperative Distributing Plants

Miscellaneous Products -

Text - Chapter XVIII -

Definitions of all milk products

ELEMENTARY GENERAL AGRICULTURAL SURVEY (Agricultural Division)

General Agriculture and Poultry

Objectives:

1. To have pupil acquire, on a seasonal basis, some basic fundamentals of agriculture not taught in agricultural project classes
2. To have pupils acquire, on a local, state or federal level, new information affecting the management and economy of agriculture

Successful Farming - Text - Paul W. Chapman

September

1. Introduction and general content of course
2. Discussion of agricultural background of class
3. *Achievements in Farming* - Text - Chapter 1, pages 1-17. Outline and discuss, answer questions 1-10.
4. *Eastern States Cooperator* - For September. Read and outline important articles.
5. What is farm cooperative? What is Eastern States Farmers' Exchange?
6. Integration in agriculture

October

1. Farmers Produce Market Reports
2. *Famous Farm Products of the South* - Text - Chapter 2, pages 17-35. Outline and discuss - answer questions 1-10.
3. Autumn Harvest Show, Massachusetts Horticultural Society, Horticultural Hall.
4. General harvesting of fruits and vegetables - simple storage - controlled atmosphere storage
5. *Eastern States Cooperator* - for October. Read, outline and discuss important articles.

November

1. Land of Rural Opportunity - Text - Chapter 3, pages 36-45. Outline and discuss. Answer questions 1-10.
2. Use of cover crops - plants used, purpose of, and planting
3. Importance of turkey growing in United States, New England, Massachusetts
4. Definitions of various terms. Types and sizes best adapted to New England markets. Prices - wholesale and retail
5. Eastern States Cooperator - for November. Read, outline and discuss important articles.
6. How Plants Grow - Text - Chapter 4, pages 47-53. Discuss. Answer questions 1-10.

December

1. Food for Growing Plants - Text - Chapter 5, pages 55-64. Outline and discuss. Answer questions 1-10.
2. Diagram on page 61 of text. Copy into notebook. Discuss in class.
3. Soil Erosion and its Control - Text - Chapter 6, pages 66-79. Outline and discuss. Answer questions 1-10.
4. Christmas Trees - Christmas tree harvesting, kinds, handling
5. Eastern States Cooperator - for December. Read, outline and discuss important articles.

January

1. Making Our Lands Rich - Text - Chapter 7, pages 82-93. Outline and discuss. Answer questions 1-10.
2. Farm inventory and simple farm accounts - Federal Income Tax returns.
3. Important breeds of poultry, standing of poultry farming in Massachusetts, New England and the United States.

4. A Poultry Flock on Every Farm - Text - Chapter 15, pages 168-180. Outline and discuss. Answer questions 1-10.
5. Eastern States Cooperator - for January. Read, outline and discuss important articles.

February

1. Advantages of Livestock Production - Text - Chapter 12, pages 135-144. Outline and discuss. Answer questions 1-10.
2. Feeding Farm Animals - Text - Chapter 13, pages 145-154. Outline and discuss. Answer questions 1-10.
3. Dairying Ranks First - Text - Chapter 14, pages 155-167. Outline and discuss. Answer questions 1-10.
4. Eastern States Cooperator - for February. Read, outline and discuss important articles.

March

1. Trees - A Farm Crop - Text - Chapter 18, pages 204-215. Outline and discuss. Answer questions 1-10.
2. Importance of lumber on the farm
3. Farming with Grass - Text - Chapter 19, pages 216-223. Outline and discuss. Answer questions 1-10.
4. Grass Silage
5. Spring Flower Show - development and scope of
6. Eastern States Cooperator - for March. Read, outline and discuss important articles.

April

1. Farming in a Machine Age - Text - Chapter 23, pages 256-266. Outline and discuss. Answer questions 1-10.
2. Electricity on the Farm - Text - Chapter 24, pages 267-276. Outline and discuss. Answer questions 1-10.

3. Fertilizers and fertilizer materials

4. Eastern States Cooperator - for April. Read, outline and discuss important articles.

May

1. The Vocation of Farming - Text - Chapter 29, pages 323-331. Outline and discuss. Answer questions 1-10.

2. Qualifications for Success in Farming - Text - Chapter 30, pages 333-342. Outline and discuss. Answer questions 1-10.

3. Specialized Farming Opportunities

4. Eastern States Cooperator - for May. Read, outline and discuss important articles.

ADVANCED GENERAL AGRICULTURAL SURVEY (Agricultural Division)

Objectives:

1. To provide a course of study including phases of agriculture which cannot be included in an agricultural program
2. To guide students in selecting and expanding their farm programs
3. To acquaint students with the various allied branches of agriculture
4. To stimulate the student's interest in reading and research in other fields of agriculture

September

I. Introduction

- A. Review of summer placement and practices
- B. Exploring opportunities in agricultural occupations
- C. Determining the outlook of various farm enterprises during the current year
- D. Dividing and studying an enterprise into problem areas with major emphasis on animal production

II. Dairy Cattle

- A. Determining the importance of dairy cattle in the United States and New England
- B. Dairy farming as a future
- C. Getting started in dairying
- D. Selecting the dairy farm

The Farmer's Handbook
Chapter XI

"Better Dairying" - Wirthmore Dairy

Service Pamphlet - Fifth Edition

E. Financing the dairy farm	
F. Planning the dairy farm program	
October - Continuation of Project II	Pages 1-120
G. Choosing a breed	
H. Selecting the individual - Purebred vs. Grade	
I. Raising calves and young stock	F.B. #1723 - Feeding, Care and Management of young Dairy Stock
J. Feeding young stock	
K. Keeping young stock healthy	
L. Housing dairy animals	
M. Providing barn and dairy equipment	
N. Determining the advantage of artificial insemination vs. regular service	
O. Feeding for milk production	F.B. #1470 - Care and Management of Dairy Cows
P. Feeding and caring for the bull	
Q. Dehorning	
R. Milking	
S. Controlling diseases and parasites	
T. Maintaining sanitary conditions	
November	
III. Marketing of Dairy Products	"The Dairyman Goes to Market" - American Dairy Association Pamphlet - Chapter I
A. Dairy farming as a business operation	
B. Producing milk - Efficient production from sound management	

C. Breeding, feeding and managing measurements and problems	Chapter II
D. Selling milk off the farm	Chapter III
E. Bargaining and cooperative associations	
F. Selling milk through privately owned organizations	
G. Setting milk price-Laws of supply and demand	Chapter IV
H. Promoting sales through processors and retailers	Chapter V
I. Creating more markets for dairy food sales by dairy farmers	Chapter VI
J. Advertising dairy products	Chapter VIII
K. Organizing a sales promotion program	Chapter VII
L. Promising careers in dairying	Chapter IX

December

IV. Beef Cattle

A. Determining the number and kind of beef cattle in the farming program	
B. Selecting the breed	Farmer's Handbook
C. Establishing a herd	Chapter X
D. Providing housing and equipment	FB #1135 - The Beef Cattle
E. Breeding - regular service vs. artificial insemination	
F. Caring for cow and calf at calving	
G. Feeding cattle for beef	

H. Fattening on grass	
I. Pasturing	
J. Controlling diseases and parasites	
K. Butchering beef animals	
L. Dehorning and castrating	
M. Marketing beef animals	
V. Horses	Farmer's Handbook
A. Selecting the breeds of draft horses	Chapter XIV - U.O.M. Leaflet - #180 Horse Production
B. Selecting the breeds of light horses	
C. Feeding horses	
D. Caring for growing stock	F.B. #619 & 952 - Breeds of Draft Horses and Light Horses
E. Caring for mare and colt	
F. Providing housing and equipment	F.B. # 1419 - Care and Management of Horses
G. Controlling diseases and parasites	
January	
VI. Poultry	
A. Determining the place of poultry in the farming program	Farmer's Handbook - Chapter XV Visit to nearby Chicken Farm, Turkey Farm, Poultry Show
B. Establishing the flock	
C. Selecting the breeders	
D. Hatching eggs	
E. Incubating eggs	
F. Feeding the growing stock	

	G.	Housing and managing the laying flock	U.O.M. Leaflet #6 Poultry Feeding
	H.	Preparing eggs for market	#160 Quality Eggs
	I.	Preparing poultry for market	
	J.	Controlling disease and parasites	F.B. 1652 Disease and Parasites
	K.	Studying and analyzing similar problems with pigeons, turkeys and rabbits	
VII.		Swine	Farmer's Handbook - Chapter XII
	A.	Determining the place of swine in the New England area	
	B.	Selecting the breed	F.B. 1263 - Breeds of Swine
	C.	Selecting and judging the individual - boar and sow	F.B. 1455 - Fitting, Showing, Judging Hogs
	D.	Providing housing and equipment	
	E.	Caring for the sow and litter	
	F.	Pastures	Beacon Feed Pamphlet - Hogs
	G.	Cooking and soaking feeds	
	H.	Controlling disease and parasites	F.B. 1914 - Disease of Swine
	I.	Curing and smoking	F.B. 1186 - Pork on the Farm
	J.	Earmarking and keeping records	
	K.	Marketing	
	L.	Butchering and cutting meat	Visit to Slaughter House

February

VIII.	Sheep and Goats	Farmer's Handbook - Chapter XIV
	A. Determining the place and number of sheep in the farming program	
	B. Choosing the breed	
	C. Selecting the individual	
	D. Providing housing and equipment	
	E. Feeding	U.O.M. Leaflet - #179 Sheep Production
	F. Flushing and breeding	
	G. Caring for ewes and lambs during lambing	
	H. Docking and castrating	F.B. #1134 Castrating and Docking Sheep
	I. Controlling disease and parasites	F.B. #1943 Diseases of Sheep and Goats
	J. Shearing	
	K. Marketing sheep, lambs, and wool	
	L. Butchering	
	M. Breeds, care, feeding and managing goats	
IX.	Bee Keeping	The Farmer's Handbook - Chapter XVIII
	A. Determining the place and extent of bees in the farming program	
	B. Studying colony organization	
	C. Providing bee hives and other equipment	
	D. Selecting the kind and obtaining bees	
	E. Locating the apiary	U.O.M. Leaflet - #148 Bee Keeping
	F. Handling and managing bees	

G. Producing the honey crop	F.B. #702 Productive Management of Honeybee Colonies in the Northern States
H.. Harvesting the honey crop	
I. Wintering honey bees	
J. Determining nectar producing crops	
K. Controlling disease and pests	
L. Packaging and marketing	
March	
X. Fish and Wild Life	The Farmer's Handbook - Chapter XIX
A. Choosing a location	
B. Building a fish pond	
C. Managing a fish pond	
D. Feeding	
E. Fertilizing	
F. Stocking the pond	
XI. Wild Life	
A. Developing homes for wild life	
B. Locating a wild life sanctuary	
C. Raising game birds	
D. Controlling harmful wild birds	
E. Production and maintenance of fur animals	
F. Controlling harmful wild animals	
G. Controlling rodents	
H. Safety with guns	

XII.	Sugar and Syrup Crops	The Farmer's Handbook - Chapter V
	A. Determining the location of areas where sugar crops - beets do well in the farm program	
	B. Planting the crop	
	C. Fertilizing	
	D. Cultivating	
	E. Irrigating	
	F. Harvesting	
	G. Controlling insects and diseases	
XIII.	Sugar Cane	
	A. Determining the location of areas where sugar crops-beets do well in the farm program	
	B. Planting the crop	
	C. Fertilizing	
	D. Cultivating	
	E. Irrigating	
	F. Harvesting	
	G. Controlling insects and diseases	
XIV.	Maple Bushes	
	A. Varieties of trees found in New England	
	B. Harvesting the sap	F.B. #1366 Making Syrup and Sugar
	C. Processing the syrup	
	D. Controlling insects and pests	

XV.	The Orchard	The Farmer's Handbook - Chapter V
	A. Determining the place and extent of fruit trees in the farming program	Outside trip to nearby orchard
	B. Selecting the site	
	C. Choosing varieties and buying trees	F.B. #1360 Growing Apples East of the Mississippi
	D. Preparing land for planting	
	E. Laying out the orchard and planting trees	
	F. Cultivating and using cover crops	
	G. Training and priming	
	H.. Pollinating to insure a set	
	I. Controlling diseases and pests	
	J. Thinning	
	K. Picking fruit	
	L. Grading and packing	
	M. Storing	
	N. Marketing	

April

XVI.	Cherries, Peaches, Pears, and Plums	The Farmer's Handbook - Chapter VII
	A. Propagating	
	B. Pollinating	
	C. Cultivating	
	D. Care and training	
	E. Pruning the trees	Spray Calendar for Orchard

	F. Controlling insects and pests	
	G. Studying spray chart for above fruits including apples	Control of insects and pests
XVII.	Trees on the Farm	The Farmer's Handbook - Chapter VIII
	A. Choosing a kind of tree to plant	
	B. Making a farm plan as to the needs of the farm 1. Windbreak and shelter belts 2. Erosion control plantings 3. Post and fuel needs 4. Money crops	F.B. #1117 - Forestry and Farm Income
	C. Cutting and storing	
	D. Controlling insects	
XVIII.	Soil Management	The Farmer's Handbook - Chapter XVII
	A. Evaluating the farm	
	B. Classifying the soil 1. Taking soil samples 2. Determining how fertility is lost 3. Causes of erosion 4. Controlling erosion 5. Effect of fertilizers on plant growth 6. Determining fertilizer needs 7. Problems in home mixed fertilizers	
	C. Establishing a field of legumes	
	D. Liming the land	
	E. Avoiding losses by water erosion	
	F. Controlling gullies	
	G. Using explosives	
	H. Rotating crops	

May

XIX. Home Ground Improvement

- A. Determining the need for improvement
- B. Developing plans for improvement
- C. Lawn care
- D. Rolling the lawn
- E. Fertilizing
- F. Planting and transplanting ornamentals
- G. Securing and planting trees
- H. Securing and planting a hedge
- I. Growing flowers for the home
- J. Growing vegetables for the home
- K. Controlling insects and pests on trees, shrubs, flowers, and vegtables around the home.

U.O.M. #248 - Your Home Grounds

U.O.M. #262 - Flower Garden

U.O.M. #279 - For a Better Lawn

XX. Preparation for Summer Project

SURVEY

Reference Material

September and October

Outlook - Agricultural Outlook for Current Year in Massachusetts, New England, and the United States	
The Farmer's Handbook - Dairy Cattle	Chapter XI Pages 218 - 229
Better Dairying - Wirthmore Dairy Service - Fifth Edition	Pages 1 - 120
Farmers' Bulletin #1723 - Feeding, Care and Management of Young Dairy Stock.	
Pamphlet - Massachusetts Selective Breeders Association	
Farmers' Bulletin #1470 - Care and Management of Dairy Cows	

November

The Dairyman Goes to Market - American Dairy Associations	Chapters I - IX

December

The Farmer's Handbook - Beef Cattle	Chapter X Pages 200 - 217
Farmers' Bulletin #1135 - Beef Cattle	
The Farmer's Handbook	Chapter XIV Pages 247 - 254
University of Massachusetts Leaflet #180 - Horse Production	
Farmers' Bulletin #619 - Breeds of Draft Horses	

Farmers' Bulletin #952 - Breeds of Light Horses

Farmers' Bulletin #1419 - Care and Management of Horses

January

The Farmer's Handbook - Poultry
Chapter XV
Pages 278 - 301

University of Massachusetts Leaflet #46 - Poultry Feeding

University of Massachusetts Leaflet #160 - Quality Eggs

Farmers' Bulletin #1652 - Diseases and Parasites of Chickens

The Farmer's Handbook - Swine
Chapter XII
Pages 231 - 246

Farmers' Bulletin #1263 - Breeds of Swine

Farmers' Bulletin #1455 - Fitting, Showing, Judging Hogs

Beacon Feed Service Bulletin - Hog Production

Farmers' Bulletin #1914 - Disease of Swine

Farmers' Bulletin #1186 - Pork on the Farm

February

The Farmer's Handbook - Sheep and Goats
Chapter XIV
Pages 262 - 277

University of Massachusetts Leaflet #175 - Sheep Production

Farmers' Bulletin #1134 - Castrating and Docking Sheep

Farmers' Bulletin #1943 - Diseases of Sheep and Goats

The Farmer's Handbook - Bee Keeping	Chapter XVIII
University of Massachusetts Leaflet #148 - Bee Keeping	
Farmers' Bulletin #702 - Production, Management of Honeybee Colonies in the Northern States	

March

The Farmer's Handbook - Fish and Wildlife	Chapter XIX Pages 355 - 369
The Farmer's Handbook - Sugar Syrup - Sugar Crops	Chapter V Pages 107 - 116
The Farmer's Handbook - The Orchard	Chapter VII Pages 160 - 182
Farmers' Bulletin #1360 Growing Apples East of the Mississippi	

April

The Farmer's Handbook - Cherries, Pears, Plums	Chapter VII Pages continued
The Farmer's Handbook	Chapter VIII Pages 183 - 192
Massachusetts Spray Calendar for Orchard Control of Insects, Pests, and Diseases	
Farmers' Bulletin - Forestry & Farm Income	
The Farmer's Handbook - Soil Management	Chapter XVII Pages 319 - 339

May

The Farmer's Handbook - Home Ground Improvement	Chapter XVII continued
University of Massachusetts Leaflet #248 - Your Home Grounds	
University of Massachusetts Leaflet #262 - Flower Garden	
University of Massachusetts Leaflet #279 - For a Better Lawn	
The Farmer's Handbook - Trees	Chapter VIII

HORTICULTURAL DIVISION

INTRODUCTORY HORTICULTURE

Objectives:

1. To help each student acquire an understanding of the principles of plant growth

2. To assure that every student acquire skills in fundamental garden and greenhouse operations

3. To develop in each student an acquaintance with a basic group of plant materials

These objectives are achieved by class participation in horticultural operations in natural and seasonal projects further developed in class study of the subject matter and related science. A seasonal approach is the guiding principle of the course, but inasmuch as the demarcation of seasons does not always coincide with some horticultural operations, new approaches to the same subject matter may frequently occur. Notable instances are the annual flowers which command the season in September, yet are planted in flats in April; perennials which are divided in the fall, but bloom in the spring; lawns which are seeded in the fall but are fertilized and rolled in the spring; and deciduous trees and shrubs which must be studied in late summer green, as bare twigs in winter, and in spring bloom to fully appreciate their uses in the landscape and insure the student complete knowledge of the plant materials that are used in the horticultural industry.

Outline of Unit	Suggested Teaching Devices
September	
Unit I - Orientation in Horticultural	
Objective: To give students an understanding of the subject matter included in horticulture	
A. Relation of horticulture to agriculture	Survey of neighborhood for uses of ornamental plants
B. Basic skills required in horticulture	Study of skill sheets in horticulture
C. Scope of the horticulture industry	Visit to productive greenhouse for study of operations
D. Opportunities for occupations in horticulture	Practice in use of primary tools in horticulture
Unit II - Garden Flowers	
Objective: To gain an understanding of annual and perennial plants, their care and culture and commercial and landscape use	
A. The use of annuals	"Book of Annuals" - Hottes Pgs. 9 - 22 "Uses of Annuals"
B. Study of thirty-five best annuals for color, height, use, flower type	"Book of Annuals" - Hottes Pgs. 60 - 161 "Annuals of Merit"
C. Seed collecting from annuals	Practice work in annual gardens Collect specimens and seeds at Woburn School Garden
D. The use of herbaceous perennials	"Book of Perennials" - Hottes Pgs. 1 - 11
E. Preparing soil for planting of perennials	"Book of Perennials" - Hottes Pgs. 12 - 18 "Garden Operations"
F. Study of thirty-five noteworthy perennials	"Book of Perennials" - Hottes, Selected references between pgs. 67 - 251 on "Noteworthy Perennials"
G. Division and planting of perennials	Practice at local nursery

H. Study of color combinations, heights and seasons of bloom of noteworthy perennials	Franklin Park Perennial Garden

Unit III - Common Weeds

Objective:

To increase the students' knowledge of plants generally through acquaintance with twenty-five common weeds; to train the student in weed recognition and control

A. Identification of twenty-five common weeds	Survey of gardens and abandoned areas for common weeds
B. Chemical control of weeds	Practice in applying weed-killing chemicals
C. Recognition of edible wild plants	
D. Recognition of poisonous wild plants harmful to animals and humans	Summaries from Fernald and Kinsey, "Edible Wild Plants of Eastern North America"
E. Botanical resemblances of weeds and cultivated plants	Encourage creation of herbarium by students Practice in pressing wild plants for collection

October

Unit IV - Deciduous Trees and Shrubs

Objective:

To familiarize the student with approximately one hundred trees and shrubs, including their culture and their use in landscape gardening, and forestry

A. Uses of shrubs	"Book of Shrubs" - Hottes Pgs. 7 - 17
B. Planting and transplanting shrubs	Field study at Arnold Arboretum
C. Thirty-five outstanding shrubs studied for specific uses	"Book of Shrubs" - Hottes Pgs. 26 - 35 Practice in skills at local nursery
D. Propagation of deciduous trees and shrubs	"Book of Shrubs" - Hottes Selected assignments between pgs. 125 - 400 Practice and demonstrations of propagation at Arnold Arboretum and local nursery

E. Planting distances in the nursery	Practice in lining out stock at local nursery
F. Uses of trees	"Book of Trees" - Hottes Pgs. 1 - 35
G. Planting and transplanting trees	Practice at nursery and Arnold Arboretum
H. Guying and winter care of trees	Field Study at Arnold Arboretum, private estates, local parks, and survey of commonly used street trees
I. Sixty-five outstanding trees	Development of notebook of leaf tracings for comparison with later tree studies "Forest Trees of New England"- Leavitt Pgs. 145 - 175

November

Unit V - Soils and Fertilizers

Objective:
To acquaint students with the structure, types and uses of soil

A. The origin of soils	"Soils" U.S.D.A. Yearbook-1957 Pgs. 17 - 48
B. Soil groups	Outside trips to study soil forms
C. Constituents of soils	Stages in soil formation to be studied at Franklin Park and Arnold Arboretum
D. Elements essential to plant growth	Class practice in soil separation
E. Trace elements and nutrient deficiencies	Field study of food deficiencies
F. Soil acidity and alkalinity	Testing of home garden soils for acidity and alkalinity Fertilizer handbooks of American Fertilizer Association
G. The nature of and preparation of fertilizers	Class study of fertilizer samples and containers
H. Fertilizer formulas and the legal meaning of labels	Class problems in determining the efficiency of fertilizers
I. The application of fertilizers	Class demonstration of fertilizer spreaders, with later outside use planned in spring lawn and garden operations
J. Manures and composts	Compost demonstrations at Franklin Park Notebook diagrams of compost piles for use in summer or spring garden operations

DECEMBER

UNIT VI - INTRODUCTION TO FORESTRY

Objective:
To acquaint the student with economic and recreational values of the forest, how to create and care for the forest, forest enemies and the importance of the forest in conservation

A. The nature of the original forest

B. The structure and physiology of trees

C. Tree geography

D. Trees and their influence on civilization

E. The classification of trees

F. A study of conifers

G. Study of deciduous tree families

"Forest Trees of New England" Leavitt Pgs. 1 - 17
"Forest Trees of New England" Pgs. 96 - 130
"Forest Trees of New England" Pgs. 139 - 144
Map making of tree locations
"Trees" U.S.D.A. Yearbook for 1949 Pgs. 19 - 38
"Forest Trees of New England" Pgs. 18 - 22
"Forest Trees of New England" Pgs. 23 - 44
Field trips for conifer identification and collection
"Forest Trees of New England" Pgs. 47 - 95

Unit VII - Seasonal House Plants

Objective:
To acquaint the student with potted plants that form the staple business of the florist in winter

A. Foliage plants

B. Decorative flowering plants

C. Plants which have particular seasonal use for the florist

Study at greenhouses of the Gardner Museum, G. Russo, Franklin Park
Skills in propagating and handling house plants to be taught at G. Russo, and at F. H. Holbrow Co. greenhouses

December

UNIT VIII - WREATH-MAKING AND CHRISTMAS DECORATIONS

Objective:

To give students sound practical experience in an essential phase of the florist business, namely wreath-making and Christmas decorating

A.	Native materials used in Christmas decorating	Visits to florists, flower market and Arboretum for study of native materials
B.	Collecting materials for wreaths and other Christmas decorations	Field trips to Sharon, and estates of cooperative friends of school for making cone and greens collections
C.	Forms of wreaths and set pieces used in florist trade	Visit to Christmas exhibit of Arnold Arboretum and the schools of design
D.	Study of cost factors in conducting florist enterprise	Pupils do ordering for all purchases in the school Christmas program. All projects are studied on a cost basis, and some students have outside projects on making decorations for gain

January

Unit IX - Winter Identification of Trees and Shrubs

Objective:

To acquaint the student with the method of distinguishing trees and shrubs in their winter condition

A.	Tree shapes	Field trips for study of tree shapes
B.	Bark and trunk characteristics	Class practice in diagraming tree shapes
C.	Twig characteristics	Collection of winter twigs, with class practice in identification
D.	Winter bud characteristics	Mimeographed keys for class use
E.	Using winter identification keys	
F.	Identification testing	

UNIT X - WOOD IDENTIFICATION AND USES

Objective: To acquaint the student with the identification, uses and economic importance of a number of common woods.

A. Uses of wood	"Trees" Yearbook of U.S.D.A. for 1949 Pgs. 615 - 649
B. Using simple keys for wood identification	"Trees" Pgs. 833 - 844 Simple key for identification
C. Comparison of density, strength and durability of various woods	Class study and practice in determining weight of woods
D. Study of forty-eight leading woods of the United States	

February

Unit XI - Introduction to Commercial Floriculture

Objective:

To acquaint the student with the culture and uses of major flower crops and pot plants used in the commercial florist business

A. Study of culture of twenty-five leading cut flower crops	Visits to Russo Bros., Bingham Florist Co., Pierce Bros. for study of flower growing
B. Study of chief commercial flower crops in marketing and use in the retail trade	Practice in care of flower crops at Holbrow Greenhouses Visits to Boston Flower Market for study of flower marketing
C. Practice and familiarizing class with identification of cut flowers	Visits to Lombardi Florist, and O'Shea Florist for experience in retail use of various flower crops
D. Study of twenty-five leading pot plants sold in the commercial flower business	Slides of cut flower crops Live and plastic reproductions of flowers for use in identification by frequent class association
1. Cultural study of crops	
2. Use of pot plants in decoration	Visits to Franklin Park Greenhouse for group study of conservatory type of pot plants
3. Practice in making dish gardens, planting terraria, and using plants in special containers	Visits to I.S. Gardner Greenhouse for study of flowering pot plants Practice at Celata Greenhouse and at Holbrow Greenhouses

March

Unit XII - Insects and Diseases of the Forest and of Trees Used in Street, Home or Estate Plantings

Objective:

To acquaint the student with insect and disease enemies of trees and measures that can be taken to combat them

A. Insect enemies of the forest	"Tress" - U.S.D.A. Yearbook Pgs. 407 - 412
1. Recognition of insect enemy by study of specimens of damage	
2. Measures used in control of the insect in the forest, and in shade or ornamental trees	
B. Insects in Wood Products	"Trees" - Pgs. 432 - 435
1. Treatment of wood to prevent insect damage	
2. Control of insects causing wood damage	
C. Diseases found in the forest and upon shade trees or ornamental trees	"Trees" - Pgs. 443 - 464

Unit XIII - Insects and Diseases of Horticultural Crops

A. Life histories and control of twenty-five horticultural insect pests	Study of life histories in twerty-five selected plates in "Insects", U.S.D.A. Yearbook for 1952
B. Disease of horticultural crops - consideration of twenty-five most common diseases	Study of twenty-five disease life histories in "Diseases", U.S.D.A. Yearbook for 1953

April

Unit XIV - Spring garden operations

Objective:

To give the student some practice and experience in the normal garden operations of spring

A. Preparing equipment for the spring garden operations

Practice in repairing and conditioning equipment to be given in the school shop

1. Inventorying
2. Repairing tools
3. Painting and glazing sash

B. Planting and transplanting

Practice opportunites at Celata Greenhouses, Holbrow Greenhouses and Franklin Park Greenhouses

1. Preparing soil in frames for transplanting
2. Transplanting from flats to pots and to frames
3. Hardening-off plants for use in open ground
4. Care of coldframes

C. Spring care of lawns

Practice on school grounds or grounds of another school

1. Lawn feeding
2. Reseeding worn areas
3. Treatment for crabgrass
4. Lawn leveling and rolling

D. Uncovering winter protection

Practice at Pine Gardens

May and June

Unit XV - Seasonal Practice

Objective:
To round out training of a limited number of students who do not go on to projects immediately

A. Study of jobs done in May and June	Outside practice
B. Review and practice on jobs done earlier by group, for fuller development of skills	

Text and Reference Books

Forest Trees of New England Arnold Arboretum	Robert G. Leavitt
"Trees" - 1949 Yearbook of U.S.D.A. Government Printing Office	
Flower Gardens for the Amateur Midland Publishers	A. C. Hottes

The Book of Annuals A. T. De La Mare Co.	A. C. Hottes
The Book of Perennials A. T. De La Mare Co.	A. C. Hottes
The Book of Shrubs A. T. De La Mare Co.	A. C. Hottes
"Soils" - 1957 Yearbook of U.S.D.A. Government Printing Office	
"Insects" - 1952 Yearbook of U.S.D.A. Government Printing Office	
Edible Wild Plants of Eastern North America	Fernald and Kinsey
"Diseases" - 1953 Yearbook of the U.S.D.A. Government Printing Office	

Film Strips on:

- Plant Propagation
- Transplanting Trees and Shrubs
- Plant Diseases
- Forest Conservation

Slides on:

- Repairing Damaged Trees
- Outstanding Trees and Shrubs
- Garden Planning

Objectives:

1. To acquaint each student with the fundamentals of commercial flower production
2. To develop in each student knowledge and skills required in advanced greenhouse operations
3. To develop in each student knowledge and skills required in utilizing flowers and potted plants for commercial sale
4. To acquaint each student with fundamentals of flower distribution and marketing

These objectives are achieved by class participation in projects that involve commercial and private greenhouses, flower shops and flower markets. During the school year, outside practice time is utilized in observation and participation in management and care procedures of cooperating greenhouse establishments. A large portion of class time is given to relating the necessary knowledge and skills to growing projects upon which students are independently engaged at home or for part-time employers. Class practice in flower arrangement is fortified by demonstrations by advisory florist friends of the department and by participation of students at opportune times in larger jobs with cooperating florists. Attention is given to the seasonal objectives in flower production and marketing, and an effort is made to have students participate in the actualities of the business seasons by making part-time placements, consistent with continued school attendance, during the rush periods.

OUTLINE OF UNIT	SUGGESTED TEACHING DEVICES
September	
Unit I. Factors Influencing Plant Growth	
Objective: To acquaint the student with factors of light, temperature, moisture and aeration in greenhouse production of flower crops	
A. Light as a factor of plant growth 1. light intensity 2. light duration 3. practical application of intensity and duration factors to crops	Laurie-Kiplinger, Commercial Flower Forcing. Pages 51-61
a. gardenia b. poinsettia c. chrysanthemum culture	Class to make charts of known information on normal bud forming period
(1.)shaded bench culture d. long day cropping (1) iris	Visit to Neponset Gardens Greenhouses, Hyde Park,for observation of shading devices
(2) snapdragon (3) chrysanthemum growing in reversal of seasons	Class to make charts of practical aspects of regulating day length, base on material in text Ball Chrysanthemum Culture Manual, Pages 1 - 11
B. Temperature as a factor of plant growth 1. effect of temperature on plant transpiration 2. photosynthesis as affected by temperature 3. respiration as affected by temperature 4. pre-cooling of bulbs by storage	Laurie-Kiplinger, Commercial Flower Forcing. Pages 61-65
5. relationship of temperature to flower formation 6. optimum temperatures for various crops	Class to make charts of practical application to growing temperatures of major crops, as found in text
C. Moisture as a factor in plant growth 1. effect of moisture on photosynthesis 2. effect of moisture on oxygen reaction	Laurie-Kiplinger, Commercial Flower Forcing Pages 65-84
3. relationship of moisture supply and mineral nutrient supply	Class exercise in design of constant level irrigation bench
4. devices in watering a. water breakers b. tensiometers c. sub-irrigation and constant level systems	Visit to Bingham Greenhouses, Dedham for study of automatic watering system
D. Aeration and ventilation as factors in plant growth 1. ventilation of greenhouses 2. soil aeration	Laurie-Kiplinger, Commercial Flower Forcing, Pages 84-88 Class demonstration of effect of packing clay soil in potting

October

Unit II. Greenhouse Construction and Heating

Objective: To acquaint the student with the types of greenhouses, methods of construction and special heating problems peculiar to greenhouses

A. Locating the greenhouse	Laurie-Kiplinger, Commercial Flower Forcing Pages 15-50
1. factors in locating the wholesale production range	
2. factors in locating the retail production range	Class exercise in designing model greenhouse range layouts
3. layout of the plant	
B. Types of greenhouses	Class exercise in planning location and bench arrangement in various types of greenhouses
1. lean-to greenhouses	
2. uneven span houses	
3. even span houses	Class visits to Franklin Park and I. S. Gardner Ranges for study of types and construction of houses
4. curved eave houses	
5. ridge and furrow houses	
C. Types of greenhouse construction	Class reference to Lord and Burnham Handbook of Greenhouse construction materials and specifications
1. pipe frame houses	
2. semi-iron houses	
3. iron frame houses	
D. Greenhouse members	
1. types of foundations	Class drawing of greenhouse foundations
2. gutters and eave plates	
3. sash bars	Class handling of greenhouse members and drawing for easy identification
E. Frames as an adjunct to the greenhouse	
1. frames for bulb and perennial storage	Class study of frames at Franklin Park Greenhouses and at I. S. Gardner Greenhouses
2. frames for starting annuals	
3. construction and heating of frames	
F. Greenhouse heating	
1. hot water systems	Class use of charts in Lord and Burnham Handbook and in text upon problems of placing heating pipes
2. steam systems	
3. determining amount of pipe required	

November

Unit III. Soil and Fertilizers

Objective: To acquaint the student with structure of soils, the treatment of soils for the greenhouse, soil mixtures and new developments in fertilizer application in the greenhouse

A. Types of soil	Laurie-Kiplinger, Commercial Flower Forcing. Pages 93-111
B. Elements essential to plant growth	
C. Microfloral activity in the soil	
D. Soil testing	Class practice in soil testing
E. The interpretation of soil tests	

F. Soil sterilization 1. steam sterilization 2. chemical sterilization a. formaldehyde b. larvacide	Laurie-Kiplinger, Commercial Flower Forcing, Pages 112-120 Observation of steam sterilization pit at Franklin Park greenhouse
G. Organic fertilizers 1. relative values of animal manures	Laurie-Kiplinger, Commercial Flower forcing, Pages 155-182
H. Preparation of compost and artificial manures for the greenhouse 1. green manures 2. peat in the greenhouse	
I. Home mixing of fertilizers 1. materials which should never be mixed	Class charts on mixing of fertilizers
J. Fertilizer requirements of major florist crops	Class recognition of hunger signs from specimens and photographs

Unit IV. Reproduction of Florists' Plants

Objective: To acquaint the student with methods of reproduction used on all crops in the greenhouse, with specific details on major crops

A. Seed production	Laurie-Kiplinger, Commercial Flower Forcing, Pages 135-228
B. Germination 1. selection and testing of seed 2. mediums for germination 3. sub-irrigation of seed bed 4. management of seed flats and seedlings	
C. Vegetative propagation of plants 1. cuttage 2. environmental factors 3. growth-inducing substances	Class exercises in making cuttings at Holbrow Greenhouses, Dorchester
D. Handling the cuttings	
E. Propagation of garden flowers and woody shrubs 1. annuals 2. perennials 3. bulbs, tubers and corms	Class demonstration of various bulbs and corms, and division of them
F. Managing the propagation schedule	Class practice in building a schedule, based on charts in Laurie-Kiplinger, Pgs. 212-227

December

Unit V. Seasonal Problems of the Florist

Objective: To cover by problem analysis some of the details of flower shop management with which students are partly familiar from working during the fall

A. Flower shop layout
B. The art involved in make-up work
C. How to buy in the market
D. Selecting pot plants for seasonal sale
E. Determining the mark-up for shop sale

Class discussion based upon problems raised by students
Class visit to Flower Market

Class visits to florists shops Lombardi Co., Russo Retail store, Rustic Gardens (Milton)

Unit VI. Flowering Pot Plants

Objective: To acquaint the student with the care and culture of major crops of flowering pot plants

A. Azaleas
    1. propagation
    2. forcing for specific holidays
    3. handling carried-over plants
B. Begonias
    1. types
    2. varieties for Christmas

Laurie-Kiplinger, Commercial Flower Forcing, Pages 413-470

Class visits to Russo Bros, and J. Celata Co., Greenhouses for study

C. Cyclamen
    1. propagation
    2. general culture
    3. pest control
D. Gardenia
E. Geranium
    1. taking the cuttings
    2. general culture
    3. fertilizing
    4. varieties
    5. pests and their control

Assignment of readings in Laurie-Kiplinger on diagnosing plant ills. pgs. 237-242
Class becomes familiar with key to nutrient deficiency symptoms on page 245 of text

F. Hydrangea
    1. handling cuttings
    2. summer culture
    3. varieties
G. Poinsettias
    1. stock plants
    2. propagation requirements
    3. taking the cuttings
    4. shading
    5. general culture
    6. deficiency symptoms

Visit to Gutowski greenhouse, Roslindale on observation of culture of these crops

January

Unit VII. Flower Judging

Objective: To acquaint the student with standards of perfection in flower and pot plant judging to the end that they will be better trained for production and marketing of florist crops

A. Gladiolus
B. Snapdragon
C. Carnations
D. Roses
E. Tulips
F. Geraniums
G. Crassula
H. Azaleas

Reference to appropriate sections of text, for each of the flower types studied - necessary for variety differences
Students are furnished with keys for identification adapted from "A Manual of Flower Judging" Pi. Alpha XI.
Judging of exhibits as set up at school by students
Exhibits of classes of pot plants are set up at greenhouses of friends of school, and students work on judging there for convenience and greater selection of exhibits

Unit VIII. Foliage Plants

Objective: To acquaint each student with foliage plants important in the florist trade, and develop knowledge of cultural requirements of each

A. Bedding plants
B. Vines
C. Palms
D. Ferns
E. Background plants
F. Succulent

Laurie-Kiplinger, Commercial Flower Forcing, Pages 471-483
Class study of specimens, slides and catalogues of foliage plants
Class visits to I.S. Gardner Greenhouses, Franklin Park Greenhouses, and J. Celata Co. Greenhouses for study of types available in each place

February

Unit IX. Identification of trees, shrubs, pot plants and cut flower crops

Objective: To impress by review the importance of knowing a basic group of plants important to all horticulturists

A. Intensive review of winter identification of deciduous trees, deciduous shrubs and vines
B. Intensive review of coniferous trees and broad-leaved evergreens
C. Review and new factors about identification of forty-five cut flowers, foliage plants and flowering plants

Outside visits to Arnold Arboretum and various greenhouses for study of specimens
Preparation of "memory aid" cards of scientific names.
Sketches and notes on characteristics of all plants studied in live specimens
Review exercises with slides, colored mounts and plastic reproductions

Unit X. Major Crops

Objective: To acquaint each student with the necessary information to successfully grow the major flower crops in the greenhouse

A. Roses
   1. equipment for culture
   2. soils for roses
   3. grafting and budding
   4. fertilization practices
   5. planning for holiday sale
   6. cutting and marketing
   7. control of disease and insects

Laurie-Kiplinger, Commercial Flower Forcing, Pages 299-331

Charts on budding and grafting

Observation of budding and grafting methods as demonstrated at Propagator's House, Arnold Arboretum

Class visit to Pierce Brothers, Waltham for study of Rose House in operation

B. Carnations
   1. propagation
   2. general culture
   3. fertilizers
   4. control of insects and diseases
   5. cutting and marketing

Laurie-Kiplinger, Commercial Flower Forcing Pages 331-336

Class visit to Bingham Bros., Dedham for study of carnation culture in practice

C. Chrysanthemums
   1. development of modern chrysanthemums
   2. classification of chrysanthemums
   3. propagation
   4. pinching and disbudding
   5. methods of extending the season for chrysanthemums
   6. time scheduling the crop of chrysanthemums
   7. diseases and insects of chrysanthemums
   8. cutting and marketing flowers

Laurie-Kiplinger, Commercial Flower Forcing, Pages 336-353

Visit to Holbrow Greenhouse, Dorchester, to study chrysanthemum culture

Practice opportunity in pinching and disbudding in seasonal visits to Holbrow's

Class chart on time schedule for planting, pinching and discontinuing lighting

March

Unit XI. Flower Arrangement

Objective : To acquaint the student with the basic principles in flower arranging, and provide him with some skills that he may use on employment

A. Principles of flower arrangement
   1. balance
   2. form
   3. height
   4. containers
   5. flower combinations

Notes on flower arrangement based on principles as outlined in Encyclopedia of Gardening, Norman Taylor

B. Practices of the florist
   1. uses of flower holders
      a. daisy holders
      b. using "Oasis"
      c. utilizing greens in the vase arrangement

Applications in class, with full student participation of principles of arrangement to vase arrangements of various kinds

2. set pieces a. sprays b. pillows c. wiring flowers d. making wreaths 3. seasonal arrangements a. color combinations for a particular season	Participation by class in make-up work at flower shops, actually assisting in a job on order. Scheduling of such practice is entirely at convenience of proprietor
4. flower arrangement for special occasions a. table arrangements b. platform arrangements	Participation by class in the floral decorations for functions of the school, including table arrangements, platform at school functions, office and library decoration for special occasions such as visiting day

Unit XII. Minor Crops

Objective: To acquaint each student with necessary information and skills to successfully grow the minor flower crops in the greenhouse

A. Sweet peas 1. type of house required 2. soils and fertilizers 3. distance of planting 4. time of planting 5. general culture 6. marketing	Laurie-Kiplinger, Commercial Flower Forcing, Pages 354-357
B. Violets 1. varieties 2. propagation 3. general culture 4. marketing	Laurie-Kiplinger, Commercial Flower Forcing, Pages 357-360
C. Snapdragons 1. sowing and transplanting 2. general culture	Laurie-Kiplinger, Commercial Flower Forcing, Pages 360-362
D. Orchids 1. propagation a. culture solutions 2. general culture 3. types 4. marketing practices	Laurie-Kiplinger, Commercial Flower Forcing, Pages 363-373
E. Gardenias 1. propagation 2. fertilizing 3. lighting and shading 4. preparation of flowers for market	Laurie-Kiplinger, Commercial Flower Forcing, Pages 373-376

April

Unit XIII. Bulbs, Corms and Tubers

Objective: To acquaint each student with the bulbs, corms and tubers grown by the commercial florist

A. Amaryllis
B. Anemone
C. Calla
D. Freesia
E. Gladiolus
F. Hyacinths
G. Iris
H. Lily
I. Narcissus
J. Tulip

Laurie-Kiplinger, Commercial Flower Forcing, Pages 392-410

Unit XIV. Miscellaneous Crops and Spring Operations of the Florist

Objective: To acquaint the student with annuals business

A. Miscellaneous annuals which are often grown in the greenhouse for cut crops
B. Annuals grown by the florist for sale as garden plants
   1. timimg the plantings
   2. care of annuals to time of sale
   3. marketing the annual plants
      a. containers
      b. determining demands of buyers
      c. methods of promoting annual plant sale as a by-product

Laurie-Kiplinger, Commercial Flower Forcing, Pages 377-391

May

Unit XV. Production Costs in Commercial Floriculture

Objective: To acquaint the student with the financial factors in successful floricultural operation

A. Consideration of labor factors in costs in present economy of the florist business
B. Labor-saving devices in ventilation and watering

Laurie-Kiplinger, Commercial Flower Forcing, Pages 530-536

C. Consideration of cost factors in the production of major crops
   1. carnations
   2. chrysanthemums
   3. snapdragons
   4. sweet peas
   5. calendulas

Class discussion, with one meeting in which a commercial grower will detail his cost problems

D. Costs of fertilizers
E. Costs of soil sterilization
F. Costs of pest control

Unit XVI. Wholesale Marketing

Objective: To acquaint the student with the operation of flower wholesale markets

A. Development of the wholesale flower business

Laurie-Kiplinger, Commercial Flower Forcing, Pages 506-529

B. Functions of the wholesaler
C. Commission and other systems of wholesaling
D. Handling of flowers at wholesale market
   1. insulation
   2. market shipping methods
E. Preparation of flowers for market

Class visit to Boston Flower Market
Discussion with manager of the Boston Flower Market to learn of the present trends in the wholesale business

F. Keeping qualities of cut flowers
   1. treatment of special crops for better shipment experience
   2. storage of flowers before shipping
   3. pre-packaging of cut flowers

June

Unit XVII. Seasonal Practice

Objective: To round out training of a limited number of students who do not go onto projects immediately

A. Review and practice on jobs done earlier by full group

Outside practice on real jobs

B. Opportunity for outside practice on jobs which may not have been available earlier in the year
   1. garden operations
   2. greenhouse operations

Text and Reference Books

Commercial Flower Forcing The Blakiston Company Philadelphia, Penn.	Alex Laurie and D. C. Kiplinger

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Mineral Nutrition of Plants and Animals University of Oklahoma Press Norman, Oklahoma	Frank A. Gilbert
Exotic Plants - Illustrated Roehrs Company Rutherford, New Jersey	Alfred Byrd Graf
Encyclopedia of Gardening Houghton Mifflin Company Boston, Massachusetts	Norman Taylor
Standard Cyclopedia of Horticulture The Macmillan Company New York City, New York	Liberty Hyde Bailey
"Insects" - 1952 Yearbook of U. S. D. A. Government Printing Office	
"Diseases" - 1953 Yearbook of U. S. D. A. Government Printing Office	

LANDSCAPE GARDENING

This course will cover the fundamentals of laying out and designing the small home grounds and also features such as gardens, play areas, etc.

Objective:

1. To prepare the student to work with a landscape gardener
2. To prepare the student to work with a nurseryman
3. To prepare the student for ownership

Text - How To Landscape Your
Grounds - Loyal R..Johnson

I. Plan Carefully Before Planting — Chapter I

- A. Charm and usefulness
- B. Greater enjoyment of our surroundings
- C. Expression of taste and personality
- D. Creating the best economic advantage
- E. Economy of execution
- F. Enjoyment of others
- G. Uplift to the community
- H. The plan
- I. The layout and grading plan
- J. The planting plan

II. Locating the House
    A. Advantageous exposure
    B. Drainage
    C. Advantage of nearness to street
    D. Not in exact center

III. Architectural Features of the Garden   Chapter III
    A. Garden enclosures
    B. Height of garden enclosures
    C. Garden walls
    D. Gray sandstone walls
    E. Coping
    F. Brick walls
    G. The stucco wall
    H. Dry stone walls
    I. Hedges
    J. Retaining walls
    K. Garden steps
    L. Piers
    M. Sundials
    N. Birdbaths
    O. Fountains and pools
    P. Depth
    Q. Construction
    R. Pool coping
    S. Water supply and drainage
    T. Garden pools with fountain heads

U. Reflections in garden pools

V. Plants in the pool

W. The plants

X. Fish

Y. Water supply

Z. Garden seats

AA. Gardenhouses

BB. Pergolas

CC. Pergola floors

DD. Color of wooden garden features

IV. How to Plan Walks, Drives, and Entrances

A. Straight or curved

B. Directness essential

C. Up or down

D. Traffic problems

E. The two-family driveway

V. Construction of Walks and Drives

A. The front walk

B. Walks - materials

C. Walks and beds

D. Walks - widths

E. Turf walks

F. Brick walks

G. Concrete walks

H. Asphalt walks

I. Macadam walks

J. Red gravel walks

K. Flagstone walks

L. Slate walks

M. Stepping stones

N. Dutch tile

O. Tanbark

P. Borders

Q. Terraces

R. Concrete driveways

S. Waterbound macadam driveways

T. Asphalt or bituminous roads

U. Concrete surfacing

V. Concrete approaches

W. Gutters

X. Concrete gutters

Y. Rubble gutters

Z. Brick and sod gutters

AA. Care of sod gutters

BB. Catch basins

CC. Gratings

DD. Connecting catch basins with drainage lines

VI. Lawns - How to Grade, Construct and Maintain

Chapter VI

A. Preliminary preparations

B. Lawns ascending from highways

C. Lawns descending from highways

D. Sub-grade

E. Underdrainage

F. Lawn grading

G. House below pavement grade

H. Terraces

I. Grading

J. How to make the lawn

  1. Sodding

  2. Lawn seed

  3. Seeding time

  4. Methods of sowing

  5. Care of lawn

K. Lawn grasses

  1. Bent grasses

  2. Bluegrasses

  3. Fescues

  4. The rye grasses

  5. Clover

L. Table to determine the percentage of viable seed

VII. What Trees and Shrubs Will You Require? Chapter VII

A. Background and framing of the house

B. Trees for framing the house

C. Foundation or base plantings

D. What to avoid in base plantings

E. Plants for base plantings - shrubs

F. Plants for base plantings - broadleaf evergreens

G. Planting for detail

H.. Avoid straight lines

I. Specimen lawn trees

J. Lawn groupings

K. Variety in border plantings

    1. Edging the border plantings

    2. Evergreens in border plantings

L. Specimen trees in front of border plantings

M. Avoid odd-shaped beds in lawn center

N. Ornamental planting on the farm

O. Summary

VIII. How to Plant and Prune Trees and Shrubs — Chapter VIII

A. How to plant a tree

B. Tree planting with dynamite

C. Pruning transplanted trees

D. Moving large trees

E. Care of trees and shrubs

F. Insect pests

G. Pruning

    1. Pruning ornamental trees

    2. Pruning shrubs

        3. Pruning hedges

        4. Pruning fruit trees

        5. Pruning grapes

        6. Pruning small fruits

IX. Flower Gardens for Gay Color Chapter IX

    A. Classification of gardens

    B. Garden entrance

    C. Garden design

    D. Garden background

    E. Perennial borders

    F. Location of hardy borders

    G. Avoid borders next to hedge

    H. Turf edge for beds

    I. Borders along a fence

        1. Borders in the vegetables garden

        2. Width of borders

        3. Preparation of border beds

    J. Time to plant

    K. Summer care

    L. Color hints

    M. Height determines sky line

    N.. Background gives character

    O. Rose chains in perennial borders

    P. Rose arches over walks

    Q. Planting in clumps

R. Bulbs and tubers in the border
    1. Spring bulbs
    2. Summerflowering bulbs
    3. Autumn bulbs

S. Annuals in the border

T. Successful rose gardens
    1. Rose garden designs
    2. Position
    3. Beds
    4. Preparation of beds
    5. Planting and care
    6. Pruning
    7. Protection in winter
    8. Varieties
    9. Climbing roses

U. Garden beds - width
    1. Preparing garden beds

V. Humus

W. Planning the garden
    1. Bulbs
    2. Annuals
    3. Hardy shrubs
    4. Evergreens

X. More than one level

Y. Planting around garden enclosures

Z. Water in the garden

X. Rock Gardens Should Seem at Home	Chapter X
A. Garden locations	
B. Placing of rocks	
C. Soil	
D. Arrangement of plants	
E. Moisture important	
F. Wall gardens we all need	
G. Garden steps with pockets for plants	
H. Time of planting	
I. Shrubs in rock gardens	
J. Evergreens in the rock garden	
XI. Wild Gardens	Chapter XI
A. Wild Gardens	
1. The wild garden set apart	
2. Walks	
3. Planting in the wild garden	
4. Flowers in the wild garden	
XII. Improving Your Garden Soil	Chapter XII
A. Soil	
B. Fertilizers	
C. Lime	
D. Mulches	
E. Compost	

XIII. Select Lists of Shrubs	Chapter XIII
A. Succession of bloom	
B. Hedges in shade	
C. Hedges in sun, low clipped	
D. Hedges in sun, tall clipped	
E. Shrubs with showy fruits	
F. Low-growing shrubs	
G. Low-growing evergreens	
H. Evergreens and shrubs for shaded places	
I. Medium-tall shrubs for foundation planting	
XIV. Select Lists of Acid Soil Plants	Chapter XIV
A. Trees	
B. Evergreens	
C. Shrubs	
XV. Select Lists of Trees	Chapter XV
A. Superior trees for specimens, roadside or street	
B. Trees which tolerate smoke and adverse city conditions	
C. Trees which tolerate ocean spray	
D. Ornamental trees	
E. Small trees planted for autumn color	
F. Small trees with attractive fruit	
G. Columnar trees	
H. Large trees planted for autumn color	

XVI. Select Lists of Vines

A. Cling to brick, stone and concrete

B. Need a trellis or wires to climb

C. Grow in shade

XVII. Planting Plans and Keys

ELEMENTARY HORTICULTURE SURVEY

(HORTICULTURAL DIVISION)

Objectives:

This course is designed for those students taking the course in Market Gardening, and those taking Horticulture. The object of this course is to present to the students in non-technical language the scientific facts underlying the rules for the care of flowers, vegetables, lawns, trees, and shrubs and relate them to daily gardening problems.

This course should make the student appreciate all the basic botanical principles of plant growth and should make it possible for him to be able to determine the "why" as well as the "how" of standard gardening practices.

I. Life Story of Plants

  Flowers

  Feature of reproduction

  Fruits

  The seed

  The seedling

II. Supply Lines and Operation Centers

  Roots

  Stem

  Leaves

III. Water

  Competition for water

  The spacing of plants

  Drought

IV. Plants at Work: Oxygen

- How a plant uses the energy released by respiration
- Oxygen in your garden
- Respiration of severed plant parts
- Respiration in non-green plants

V. Food for Growth: Sugar

- Growth and your garden

VI. Light

- Light requirements of house plants
  - Light requirements of upright-foliage plants
  - Foliage vines
  - Flowering plants
- Annuals for shady outdoor places
- Perennials for shady locations
- Shrubs for shady areas
- Trees for shady places
- Grass for shady places

VII. Temperature

- Low temperatures
- Beneficial effects of low temperature
- High temperature

VIII. Soils and Nutrition

- Soil ingredients necessary for plant growth

Soil acidity

Soil texture

Detrimental soil ingredients

Soils, plants, and animal nutrition

Effect of plants on the soil

Nutriculture

IX. Plant Hormones

X. Seasonal Phenomena

Winter

Spring

Summer

Autumn

Rest periods

XI. Planting and Propagation

Planting seeds in flasks

Transplanting trees and shrubs

Propagation of plants

Root tubers

Cuttings

Grafting and budding

XII. Flowering

Length of day and flowering

Temperature and flowering

Natural bloom sequence

Flower timetable: Three seasons

XIII. Plant Breeding

Hybridizing

XIV. Science Explains Heredity
  - The cell
  - Chromosomes and genes
  - How genetics is used
  - Something new

XV. Insects and other Garden Pests
  - Sap-Sucking Insects
    - Aphids
    - Thrips
    - Scale insects
    - Mealy bugs
    - Lace bugs
    - Leafhoppers
  - Chewing Insects
    - Leaf-eating caterpillars
    - "False caterpillars"
    - Borers
    - Leaf miners
    - Beetles
    - Grasshoppers
    - Springtails
  - Other Garden Pests
    - Spider mites
    - Sow-bugs
    - Millipedes
    - Nematodes
    - Slugs and snails

- Chemical Control of Insects and Other Pests
    - Nicotine
    - Rotenone
    - Pyrethrum
    - DDT
    - Benzene hexachloride
    - Lindane
    - Chlordane
    - Aramite
    - Ovotran
    - Staffer R242
    - Parathion
    - Malathion
- Preparation of Sprays

XVI. Bacteria, Viruses, and Fungi

- Bacteria
- Viruses
- True fungi
- Some commons diseases of ornamental plants

XVII. Plants Without Seeds

- Algae
- Lichens
- Mosses and related plants
- Ferns and related plants
- Selaginellas and horsetails

XVIII. The Seed Plants

- The Evergreens
  - Larix
  - Pinus
  - Tsuga
  - Picea
  - Pseudotsuga
  - Abies
  - Sequoia
  - Thuja
  - Juniperus
- Plants with Flowers
- The Monocots
  - The lily family
  - The iris family
  - The orchid family
  - The grass family
- The Dicots
- The Dicots with Petals and Sepals Below the Ovary
  - The mustard family
  - The pink family
  - The potato family
  - The snapdragon family
  - The mint family

Dicots on Line Leading to Sepals and Petals on Top of the Ovary

- The pea family
- The rose family
- The cactus family
- The walnut family
- The birch family
- The oak family
- The carrot family
- The honeysuckle family
- The sunflower family

XVIX. Evolution

Theories of Evolution

- Inheritance of acquired characteristics
- Theory of natural selection
- Modern concepts of evolution

XX. Plant Communities

Water Determines the Type of Vegetation

- Precipitation between 15 and 28 inches
- Less than 15 inches of precipitation
- Precipitation above 28 inches

Plant Structures and Habits Related to Water Supply

- Water plants
- Desert plants

Middle plants

Social life of plants

XXI. Conservation

Forest Conservation

Agencies working for forest conservation

Conservation of grasslands

Conservation of cultivated fields

ADVANCED HORTICULTURAL SURVEY

Objectives:

1. To survey certain aspects of horticulture that should be the common knowledge of students in floriculture and in landscape gardening.

2. To acquaint each student with the culture of many plant crops that may be employed in landscape gardening as well as in commercial floriculture.

3. To survey some seasonal operations in plant growing and greenhouse management that are equally useful to students of landscape gardening and to students of commercial floriculture.

These objectives are achieved by class study of twelve units selected for survey and based upon seasonal practices. An opportunity is afforded for the consideration of topics relating to business management practices and problems on individual projects of students.

ADVANCED HORTICULTURAL SURVEY

OUTLINE OF UNIT	SUGGESTED TEACHING DEVICES
September	
Unit I - Sterilizing Soils	
Objective: To familiarize the student with the science and skills involved in the treatment of soils to prepare them for use in seed beds and benches, as well as the control of limited areas in outdoor growing projects.	
A. Steam sterilizing	Ball, "Red Book", Pages 26-43
1. sources of steam	
2. getting steam to bench	Diagrams of greenhouse plans
3. fastening covers	
4. duration of steaming	
5. after-steaming problems	
6. problems in outdoor steaming	
B. Chemical sterilizing	Ball, "Red Book", Pages 44-47
1. use of chemicals under glass	Class demonstrations with chemical containers
2. use of chemicals outside	
C. Chemical weed control	Ball, "Red Book", Pages 48-49 Class demonstration with manufacturers' samples
October	
Unit II - Pansy Culture	
Objective: To familiarize the student with the commercial importance of the pansy crop in this area, and review the growing procedures.	
A. Recapitulation of summer practices in the seeding and care of pansies	Photographs Summer notes of students made while on placement
B. Preparation of pansy beds for winter, and mulching	Ball, "Red Book", Pages 220-224
C. Disbudding	
D. Anticipation of spring care	

Unit III. - Spring Flowering Bulbs

Objective: To familiarize the student with the uses and care of spring flowering bulbs.

A. A study of spring flowering bulbs that may be grown in gardens	Class practice in identification of spring flowering bulbs
B. Preparation of bulb beds out-of-doors	Class preparation of charts on planting depth of various kinds of spring flowering bulbs
C. Design and care of the bulb cellar, and care of bulbs in covered cold frames	Ball "Red Book", Pages 179-181 Pages 197-198 Pages 277-279
D. Techniques in forcing spring flowering bulbs for indoor use	

Unit IV. - Carnation Culture

Objective: To familiarize the student with the culture of the most important New England cut flower crop.

A. Ten leading carnation varieties	Class identification of types
B. Selection of cuttings	Ball. "Red Book", Pages 115-123
C. Storage of cuttings	
D. Care of rooted cuttings	
E. Feeding of plants	
F. Pinching and stringing	

November

Unit V. - Seed Management

Objectives: To acquaint students with commercially important details of seed management and control.

A. Seed germination	Ball "Red Book", Pages 14-22
B. Useful facts on seeds	Ball "Red Book" Pages 65-69
C. About unchecked growth	Ball "Red Book", Pages 23-25
D. Review of seed testing methods	Class construction and practical application of testing methods

Unit VI. - Practical Soil Management in the Greenhouse

Objective: To qpply for the use of each student lessons on soil management particularly important to greenhouses.

A. Soil testing	Ball "Red Book", Pages 50-53 Class use of soil testing devices
B. Fertilizer applications	Ball "Red Book", Pages 53-59 Class study of fertilizer concentrates and literature of manufacturers of concentrates

December

Unit VII. - Seasonal Crops

Objective: To familiarize each student with the seasonal nature of the florist business, with emphasis on crops for the Christmas season.

A. Seasonal bloom calendars	Ball "Red Book", Pages 60-64
B. Azaleas for Christmas	Ball "Red Book", Pages 100-104
C. Christmas cherries and peppers	Ball "Red Book", Page 126
D. Cyclamen	Ball "Red Book", Pages 176-178
E. Poinsettias	Ball "Red Book", Pages 232-236 Class practice in wrapping Christmas plants for shipment and delivery

January

Unit VIII. - Major Crop Studies

Objective: To give each student a cross-section of some of the major seasonal crops that extend over a large part of the operational year.

A. Forcing croft lilies for Easter	Ball "Red Book", Pages 210-214
B. Chrysanthemum culture	Ball "Red Book", Pages 127-171
1. field soils	
2. fertilizers	
3. varieties	
4. disbudding schedule	
5. light and shade	
C. Pot Chrysanthemums	Ball "Red Book", Pages 171-176
1. pinching	
2. temperature	

February

D. Snapdragons	Ball "Red Book", Pages 252-264
E. Forced perennials	Wayside Plant Catalogue
1. preparation for forcing	Weston Nurseries Catalogue
2. low temperature storage	Class study of seasonal bloom
3. blooming dates	dates of perennials from charts

March

Unit IX. - Fundamentals of Bedding Plant Culture

Objective: To acquaint each student with the importance of the bedding plant business in the florist and landscape trade, and with the soundest business methods in merchandising.

A. Fundamentals of bedding plant culture	Ball "Red Book", Pages 9-14
1. soil preparation	Class demonstration of soil preparation and germination techniques
2. germination techniques	
3. feeding the plants	
4. timing the sowings	
5. plant containers	Ball "Red Book", Pages 70-72
B. Application of business methods to sales of bedding plants	Ball "Red Book", Pages 3-9
1. displaying products	Study of garden sections of Sunday papers, and advertising in horticultural magazines
2. selection of containers to gain sales appeal	
3. advertising wares	

April

Unit X. - Bedding Plant Studies

Objective: To acquaint each student with the cultural requirements of individual bedding plants grown for the trade.

A. Geraniums	Ball "Red Book", Pages 189-190
B. Ageratum	Ball "Red Book", Pages 89-90
C. Begonias	Ball "Red Book", Pages 105-107
D. Coleus	Ball "Red Book", Pages 174-175
E. Dahlias	
F. Petunias	Ball "Red Book", Pages 225-230

May

G. Candytuft	Ball "Red Book", Page 114
H. Dianthus	Ball "Red Book", Pages 184-186
I. Verbena	Ball "Red Book", Pages 279-280
J. English Daisy	Ball "Red Book", Pages 167-168

Unit XI. - Perennials in the Trade

Objective: To acquaint each student with the major perennials used in the florist and landscape business.

A. Perennials for the early spring	Class reference to catalogues of leading nurseries
B. Perennials for rockeries	
C. Perennials for the continuing border	
D. Seasonal problems in perennial production	
1. summer division	
2. summer perennial propagation in seed beds	

June

Unit XII. - Review of seasonal jobs and practical problems for students not on placement

AGRICULTURAL SHOP COURSE OF STUDY

First Year	Sketching and Drawing Woodwork and Farm Carpentry Metal Work
Second Year	Electricity on the Farm Farm Water and Waste System
Third Year	Gas Engines and Vehicle Maintenance Small Farm Building Construction

AGRICULTURAL SHOP COURSE OF STUDY

Objectives:

1. A good general knowledge of Farm Mechanics
2. The ability to visualize and understand the proper sequence and methods used in going about a job to achieve the desired end
3. A full comprehension of jobs that would be worth while and possible for the student to do himself when actively engaged in general farm maintenance and repair
4. The proper use of a tool, its potential care and upkeep
5. The benefit of neat and orderly work and shop practices
6. Practical shop and work safety methods will be stressed at all times
7. How to equip and lay out a Farm Shop
8. Jobs that would be impractical to attempt without costly tooling up and the aid of a specialist

A discussion and understanding of the need of a good knowledge and ability to make a clear working sketch or drawing or to interpret sketches, drawings or prints made by others in the modern farm program.

	TEACHING POINTS
I. Making freehand sketches	A. Sketching lines B. Choosing the view of the object C. Alphabet of lines using the right kind of line D. Dimensioning sketches and drawings E. Making sectional views
II. Making pictorial sketches and drawings	A. Three classes 1. isometric 2. oblique 3. perspective
III. Reading working drawings and blueprints	A. The scale B. Elementary symbols used C. Taking measurements from blueprints, drawings D. Make a pictorial sketch from a blueprint
IV. Working drawings with standard drawing equipment	A. Drawing board B. Tee square and triangles C. The architect's scale D. Compass and dividers
V. Lettering sketches and drawings	A. Title B. Scale C. Dimensions D. Other information that may be needed. Specifications as to materials to be used
VI. Scale drawings and broken drawings	A. The architect's scale B. Dividers C. Increasing D. Decreasing E. How to make brakes
VII. Drawing curves and ellipses	A. The compass B. Plotting a curve C. French curve D. Trammel method E. Approximate method

WOODWORK AND FARM CARPENTRY

In the comprehensive farm wood working program the need of the strdent farmer to understand the methods involved in making repairs and constructing appliances using wood as a material will be stressed. It will be demonstrated that it is fairly easy to become proficient in the use of wood working tools. All fundamental tool processes including tool upkeep will be paramount in this course.

	TEACHING POINTS
I Selecting kind and grade of lumber for the job	A. Soft woods B. Hard woods C. Grades of lumber (1) Select (2) Common (a) rough (b) surfaced two sides (c) surfaced four sides D. Board foot measure E. Durable or lasting quality
II Measuring with common tools used for the purpose	A. Reading a rule B. Accurate ways to measure and the tool to use 1. length 2. inside measure 3. diameter 4. circumference 5. depth 6. odd shapes C. Tools used in measuring 1. rule 2. steel tape 3. combination square D. Care of measuring tools
III Laying out a job	A. Accurate measure B. Marking 1. with pencil 2. with knife 3. with scratch awl C. Duplicate measure D. Allowance for kerf E. Getting the most out of a piece of lumber

TEACHING POINTS

- F. From patterns - transfer
- G. Selection of proper stock to fit job
  1. avoiding wasteful practice
  2. advantage of rough or finished lumber
  3. durable or proper lasting quality of stock selected

IV. Cutting stock to measure

- A. Selecting proper saw
  1. cross cutting
  2. ripping
- B. Positioning stock
  1. use of saw horse
  2. use of bench and vise
- C. Starting the cut
  1. allowance for kerf
  2. following guide line
  3. avoiding splintering at end of cut
- D. Sawing curves
  1. compass saw
  2. coping saw
  3. keyhole saw
- E. Care and upkeep of saws

V. Squaring stock

- A. Rules for squaring stock
  1. find convex side - mark it
  2. plane better edge square to it
  3. gauge width
  4. square better end
  5. lay of length and square other end
- B. Using the try square
- C. Using the marking gauge
  1. setting to measure
  2. scoring the line
  3. care and repair of gauge
- D. Edge planing
  1. use and setting of the jack plane
  2. care of the jack plane
  3. sharpening the jack plane iron

	TEACHING POINTS
	E. Squaring an end 1. with back saw and bench hook 2. with mitre box
VI. Planing and smoothing wood	A. Edge planing B. Surface planing C. Butt planing
VII. Shaping other than square stock	A. The use of a hatchet 1. care and repair of the hatchet B. The use of the spokeshave 1. care and repair of the spokeshave C. Rasping and filing D. Use of the draw knife
VIII. Fitting tool handles	A. Removing worn or broken handle B. Selection of new handle C. Fitting D. Setting wedges E. Other replaceable handles
IX. Boring holes in wood	A. Use of brace and bit 1. care of the brace 2. how bits are sized 3. chucking a bit B. Centering the bit 1. How to plot the center 2. using the awl 3. boring a straight hole 4. boring a deep hole 5. boring at an angle 6. preventing splintering C. Using the expansive bit 1. care of the bit 2. setting to measure D. Sharpening bits 1. with special file 2. with attention to all general care of bits - straightening, storing, polishing

	TEACHING POINTS
	E. Use of the depth gauge 1. setting the depth gauge 2. care of depth gauge F. Other bit brace attachments their use and care 1. bit extension 2. countersink 3. screw driver bit 4. dowel pointer 5. hole saw 6. twist bits or bit stock drills
X. Hand drilling in wood	A. Hand drill B. Breast drill 1. chucking a drill 2. drilling a straight hole 3. drilling at an angle 4. use of the awl to prevent skidding 5. drilling to depth 6. how drills are sized 7. care and sharpening of a drill
XI. Sawing square or odd shaped holes in wood	A. Plotting B. Starter hole C. Relief holes 1.brace and bit D. Sawing 1. keyhole or compass saw 2. standard hand saw
XII. Use of the chisel	A. Kinds of chisels B. Care and sharpening C. Cutting with a chisel 1. with the grain 2. across the grain 3. use of a mallet 4. dadoes 5. mortise 6. rabbet

TEACHING POINTS

XIII. Fastening Wood

- A. Nails
  - 1. kinds of nails
  - 2. how to select the best nail for the job
- B. Kinds of nail hammers
- C. The use of the nail set
- D. Driving nails properly
  - 1. driving
  - 2. Pulling
  - 3. setting
  - 4. clinching
  - 5. proper nailing sequence for strength and avoiding splitting
  - 6. toe nailing
  - 7. draw nailing
- E. Screws
  - 1. kinds of screws
  - 2. how to select the best screw for the job
- F. Use of the screw driver
  - 1. types of and special purpose screwdrivers
  - 2. care and repair of the screwdriver
- G. Plotting screwholes
  - 1. use of the awl
  - 2. drilling pilot and body holes to depth
  - 3. countersinking
  - 4. use of the screwmate set
- H. Lag bolts and lag screws
  - 1. types
  - 2. selection for job at hand
  - 3. plotting for strength accuracy
  - 4. drilling pilot and body hole - clamps for accuracy
  - 5. use of a washer
  - 6. setting the lag
- I. Use of standard carriage bolts
  - 1. types
  - 2. selection for job at hand
  - 3. plotting hole accuracy
  - 4. drilling through hole clamping for accuracy
  - 5. use of washers
  - 6. setting bolt

	TEACHING POINTS
	J. Other methods of fastening wood with metal aids 1. angle irons 2. mending or reinforcing plates 3. corrugated fasteners 4. scotch fasteners 5. bolts and washers
XIV. Common wood joints	A. Types of wood joints 1. butt 2. lap 3. rabbet 4. dado 5. dado and rabbet 6. mitre 7. mortise and tenon B. Selection of proper joint for job at hand C. Making joint by plotting and cutting D. Doweling 1. selection of dowel by size 2. boring holes by plotting and aligning 3. use of doweling jig E. Glue joints 1. types of wood glue 2. selecting proper glue for job at hand F. Using clamps or clamping and holding devices to secure joint until glue has set
XV. Shaping wood to fit curved or irregular surfaces	A. Use of dividers to fit board to irregular surface B. Cutting to line 1. hatchet 2. saw 3. drawknife
XVI. All cuts commonly made with the mitre box	A. Plotting cuts B. Care and repair of the mitre box and saw
XVII. Setting builders hardware	A. Standard hardware 1. hinges 2. locks 3. hasps 4. sash hardware 5. snap catches B. Plotting inlets and borings

TEACHING POINTS

XVIII. Glazing

A. How to measure glass for sash replacement
B. Preparing sash to receive glass
  1. removing old points and putty with heat or scraping
  2. painting and bedding
  3. leveling
C. Cutting glass to measure
  1. flat working area
  2. straight edge
  3. lubrication
  4. using the cutter
D. Setting the glass
  1. bedding
  2. setting points
  3. sealing with compound

XIX. Painting and Finishing

A. Kinds of paint
  1. outside
  2. inside
  3. varnish
  4. shellac
  5. masonry
  6. metal
B. preperation of the surface to be painted
  1. new work
  2. old work
C. Selection of finish to be used
  1. proper paint for the job
  2. mixing paint
D. Brushes
  1. kinds of brushes
  2. selection of brush for the job
  3. care and cleaning of brushes
E. Safe storage of painting supplies
F. Estimating paint needed for a job

METAL WORK

	TEACHING POINTS
I. Sheet Metal	A. Identification of and use:
	1. bright tin
	2. galvanized iron
	3. sheet steel
	4. sheet copper
	5. sheet zinc
	6. sheet brass
	7. sheet aluminum
	8. sheet stainless steel
	B. Use of a sheet metal gage
II. Iron and steel	A. Identification and use
	B. Spark test
	1. cast iron - gray white
	2. malleable iron
	3. wrought iron
	4. carbon steel
	5. alloy steel
III. Stock Metal	A. Identification and use
	1. channels
	2. angles
	3. plates
	4. hot rolled bars and strips
	5. cold finished rolled bars
	6. rounds
	7. hexagon
	8. squares
	9. structural
IV. Marking and Layout	A. Rule - metal straight edge
	B. Scribes
	C. Scratch awl
	D. Center punch
V. Cutting Metal	A. Hand tools
	1. snips
	2. cold chisel hammer and vise, anvil hardy
	3. bolt cutters
	4. hack saw
	B. Foot squaring shears
	1. machine description adjustments and stops
	2. proper positioning of metal to be cut

TEACHING POINTS

3. cuts possible on the shears
4. safety rules to be observed

VI . Making holes in metal

- A. Drilling
- B. Punching
  - 1. Solid punch
  - 2. hollow punch
  - 3. hand punch
- C. Odd shaped holes
  - 1. punch and shears
- D. Circle cutters and hole saws

VII. Drilling Metal

- A. Carbon drills
- B. High speed drills
  - 1. sharpening a drill
  - 2. preparing work for drilling
  - 3. selection of proper size twist drill
  - 4. use of oil in drilling
  - 5. rate of speed in drilling
  - 6. fastening work for drilling
  - 7. use of lead hole when drilling with larger drills
- C. Use of the drill gage

VIII. Riveting - riveting tools

- A. Kinds and uses of rivets
  - 1. tinners
  - 2. soft iron
  - 3. aluminum
  - 4. copper
    - (a) mark hole
    - (b) drill or punch hole
    - (c) select proper rivet
    - (d) set rivet
    - (e) peening
  - 5. care and use of rivet set, rivet hammer
  - 6. use of burrs

IX. Bolting metal

- A. Kinds and uses of bolts
  - 1. steel
  - 2. brass
  - 3. plated
  - 4. nuts, plain, lock
  - 5. washers, plain, lock

	TEACHING POINTS
X . Sheet metal screws	A. Kinds and uses
XI . Removing bolts and rivets	A. Cutting with cold chisel and hammer B. Drilling out - punching 1. use and care of drift punch C. Use of easy out or screw extractor
XII . Threading with taps and dies	A. Use of a screw pitch gage B. Use of the drill and tap chart to select proper drill, tap, die C. Kinds of bolts and machine screws D. Kinds and uses of taps and dies
XIII . Soldering	A. Kinds of solder B. Flux - kinds and uses C. Selection of proper soldering iron 1. heating the iron 2. cleaning the metal to be soldered 3. fluxing 4. soldering 5. holding the metal in position
XIV . Common hems, seams, and joints in metal work	A. Single hem B. Double hem C. wired edges D. Lap seams E. Folded seams F. Grooved seams
XV . The bar folder	A. Adjustments and stops machine description B. Forming a lock C. Preparing an edge to receive a wire D. Preparing grooved seams E. Preparing flanges of various angles F. Safety rules to be observed

	TEACHING POINTS
XVI. The cornice brake (Chicago Steel)	A. Adjustments and stops machine description B. Proper positioning of metal to be formed C. Bends possible on the cornice brake D. Use of attachments to form circular and semicircular bends E. Safety rules to be observed
XVII. The slip roll	A. Adjustments and stops machine description B. Proper positioning of metal to be formed C. Safety rules to be observed
XVIII. Forming metal with the steel stakes	A. Selecting proper stake B. Use of a soft hammer C. Locking metal seams 1. hand groovers
XIX. Use of all hand machines	A. Adjustments and stops machine description 1. burring 2. turning 3. wiring 4. flanging 5. flattening 6. crimping 7. beading B. Safety rules to be observed
XX. Use of all hand tools to form metal	A. Hammer B. Hand seamers C. Handy seamers D. Special tools E. Dollies F. Angle iron and clamps
XXI. Cold bending and forming	A. Round stock B. Flat stock

ELECTRICAL COURSE FOR FARM SHOP

	TEACHING POINTS
I. Discussion and understanding of electrical units	A. Volts B. Amperes C. Watts D. Kilowatt E. Horse Power
II. Reading Meters	A. Voltmeters B. Watt hour meters C. Figuring power bills
III. Understanding the meaning of electrical symbols	A. In house wiring B. In farm building wiring
IV. Testing and Replacing fuses	A. What a fuse does B. Selecting the right fuse 1. Plug 2. cartridge 3. fusetrons 4. use of fuse puller
V. Constructing a simple two-wire circuit	A. Surface wiring on a board
VI. Constructing a simple three-wire circuit	A. Surface wiring on a board
VII. Understanding the causes of voltage drop	A. Determining the effect of wire size B. Selecting proper wire size C. Types of wire - selecting proper type
VIII. Identifying the live and grounded wires in a circuit	A. Color code of wires B. Importance of grounding
IX. Testing procedures	A. Short circuits B. Grounded circuits C. Make a simple test light D. Locating electrical defects
X . Electric Motors	A. Oiling - greasing B. Cleaning C. Selecting the right motor for the job D. Controls for electric motors E. Pulleys and belts - proper installation F. Motor mounting

	TEACHING POINTS
XI. Electric wiring repairs and replacements	A. Connecting wires 1. to terminals 2. soldering connectors 3. use of solderless connectors 4. splicing - run - tap 5. tapping - rubber plastic - friction B. Replace defective devices 1. single pole switches 2. three-way switches 3. four-way switches 4. wall receptacles 5. lamp sockets 6. cord caps C. Assembling extension cords

FARM WATER AND WASTE SYSTEM

TEACHING POINTS

I. Pipe
- A. Steel - galvanized iron
- B. Brass - copper
- C. Cast Iron
- D. Tile
  - 1. how pipe and tubing are sized
  - 2. use of each type

II. Cutting pipe
- A. Measuring
  - 1. allowance for fitting or joint
- B. Cast iron
  - 1. chain cutter
  - 2. hammer and cold chisel
- C. Steel and other metal pipe
  - 1. with standard pipe cutter
- D. Tile
  - 1. with hammer and chisel
- E. Safety measures to observe

III. Threading pipe
- A. The die stock
  - 1. how to set it up for use
  - 2. starting the thread
  - 3. use of oil
  - 4. depth of thread
  - 5. reaming

IV. Fittings and uses
- A. To change direction
  - 1. elbow - tee - cross
    - (a) short pattern
    - (b) long sweep
    - (c) Y or lateral
- B. To control the flow
  - 1. faucets
  - 2. valves
  - 3. pressure regulations
  - 4. float valves
- C. Other common fittings
  - 1. reducing - increasing
    - (a) bushings
    - (b) couplings
    - (c) elbows - tees
    - (d) others
  - 2. unions
  - 3. couplings
  - 4. air chambers
  - 5. sprinkler heads
  - 6. strainers
  - 7. traps
  - 8. clean outs
  - 9. frost proof
  - 10. foot valves
  - 11. check valves

TEACHING POINTS

V. Making up a fitting - threaded
- A. Vise and wrench
- B. Two wrenches
  - 1. choice of wrench
  - 2. pipe joint cement
- C. Breaking apart pipes and fittings that are threaded
- D. Solder fittings
  - 1. cleaning pipe and fitting
  - 2. solder paste and flux
  - 3. torch
    - (a) lighting
    - (b) safty measure to observe
  - 4. soldering
- E. Flare fittings
  - 1. flaring tools
  - 2. cleaning pipe and fitting
  - 3. use of the flaring tool
  - 4. make up with wrenches
- F. Flange fittings
  - 1. line up of flanges
  - 2. cleaning flange
  - 3. cutting a gasket
  - 4. take up procedure

VI. Farm water system
- A. City main
- B. Well
  - 1. plan of a farm water system from a city main
  - 2. plan of a farm water system well fed

VII. Pumps
- A. Shallow well
  - 1. farm pond
  - 2. reservoir
- B. Deep well
  - 1. driven well
  - 2. dug well
- C. Pump repair and maintenance
  - 1. pump leathers and parts
  - 2. cleaning clogged screens
  - 3. testing for performance
- D. Foot valve maintenance

	TEACHING POINTS
VIII. Water system repairs	A. Faucets and valves 1. replacing washers 2. seat dressing 3. stem packing B. Pipe leaks 1. soldering 2. replacing bad sections 3. emergency clamp 4. finding leaks C. Thawing frozen pipe lines 1. with a torch 2. by hot water 3. by electricity D. Float valve repairs 1. soldering a float 2. renewing a float 3. renewing washer and seat 4. adjusting float valve E. Repairing a leak in a tank or trough 1. soldering 2. patching and soldering 3. use of the bolt patch
IX. Planning a frost proof farm water system	A. Ground frost line B. Frost proof fittings C. Insulation D. Electric heating coils
X. The waste system	A. Component parts 1. drains 2. vents 3. traps 4. septic tank 5. leechers 6. city sewer 7. cleanouts
XI. Waste system maintenance	A. Clearing a stoppage B. Thawing a line C. Clearing a septic tank

GAS ENGINE AND VEHICLE MAINTENANCE

	TEACHING POINTS
I. Standard types	A. Vertical or inline B. V type C. Opposed D. Horizontal
II. Basic power plant	A. Cylinder block B. Cylinder head C. Crankshaft D. Pistons E. Piston rings F. Connecting rods G. Valves H. Camshaft I Timing gears or chain
III. The four stroke cycle	A. Intake B. Compression C. Power D. Exhaust
IV . The cooling system	A. Air 1. small gas engines and aircraft engines large surface dissipating fins in design of casting B. Liquid cooled 1. in general use on vehicles, radiator, fan, water jackets, pump and thermostat C. Anti-freeze solutions 1. volatile (alcohol) 2. (ethylene-glycol) non volatile
V . Lubrication and lubricants terms explained	A. Viscosity B. Pour point C. Flash point D. S.A.E. S-W, 10W - etc. E. Detergent - "MS" - "DG"
VI . Engine lubrication system	A. Crank case B. Pump C. Oil filter D. Breather tube (air cleaner) E. Oil passages in engine parts and tubes

GAS ENGINE AND VEHICLE MAINTENANCE

	TEACHING POINTS
VII. Engine fuel system	A. Storage tank B. Carburetor C. fuel pump D. fuel lines E. fuel injection system (no carburetor)
VIII. Ignition system	A. Battery B. Relay C. Ignition switch D. Resistor E. Coil F. Distributor G. Spark plug H. Wiring
IX. Gas Engine maintenance	A. To change engine oil B. To test anti-freeze and care for the radiator C. To adjust carburetor idle mixture and speed D. To remove and clean fuel filter on carburetor air cleaner E. To test and care for the storage battery F. To clean and adjust spark plugs
X. The Automotive or tractor electrical system	A. Wiring diagrams B. The starter and starting motor operation C. The importance of the generator regulator D. How the electrical system is protected
XI. Electrical system maintenance	A. To remove and replace burned out fuses B. To remove and replace burned out lamp bulbs C. To remove and replace a sealed beam headlamp unit D. To clean a generator commutator
XII. Vehicle - running gear	A. The suspension system B. Anti-friction bearings C. Understanding tires D. Care of tires E. Wheel alignment and its relation to tire wear

	TEACHING POINTS
XIII. Running gear maintenance	A. To remove and repair a tire and tube B. To change a spare tire and wheel C. To check wheel alignment by tire wear D. To inspect and adjust wheel bearings E. To lubricate the running gear
XIV. General chassis lubrication	
XV. Small gas engines	A. Two cycle B. Four cycle
XVI. Trouble shooting	A. Tune up B. Reconditioning

FARM BUILDING CONSTRUCTION

	TEACHING POINTS
I. Planning a small building	A. Drawing up plans B. Selection of site C. Bill of materials
II. Concrete work	A. Selecting good materials B. Determining proportions of materials C. Estimating quantities of materials needed D. Building and preparing forms E. Reinforcing concrete F. Measuring and mixing the materials G. Placing concrete H. Finishing concrete I. Protecting fresh concrete while curing J. Removing forms K. Making watertight concrete L. Setting bolts in concrete that has hardened
III. Concrete floors for farm buildings	
IV. Building with concrete masonry	A. Shapes and sizes of concrete masonry units B. Laying masonry units C. Mortar for concrete masonry construction D. The footing E. How to use the plumb line and level F. Use of lintels G. Anchoring roofs H. Finishing concrete masonry
V. Laying out the site	A. Use of farm level B. Use of the steel tape C. Setting the corner stakes D. Erecting batter boards E. Setting cord lines
VI. Trenching and Foundation construction	A. Size of foundation B. Depth of footing C. Frost line D. Sill bolting
VII. Flooring	A. Wood B. Concrete C. Tile D. Drains

	TEACHING POINTS
VIII. Erecting the walls	A. Sills B. Framing C. Locating doors and windows D. Siding
IX. Putting on the roof	A. Rafter cutting B. Sheathing C. Shingling D. Flashing
X. Finishing the Building	A. Installing door and windows B. Shingling sides C. Fire stopping draft proofing D. Window and door trim E. Boxing in eaves F. Gutters and down spouts G. Building stairs and steps
XI. Painting	A. Outside B. Inside

WELDING

	TEACHING POINTS
I. What is welding?	A. Theory of the electric current melting the electrode and the base metal, thus fusing them together
II. Safety	A. Rays of the arc B. Slag chips C. Safety clothing D. Hot electrode stubs E. Ground clamp
III. How to weld	A. Position 1. right handed 2. left handed 3. two handed method
IV. How to stride an arc	A. Scratch method B. Holding an arc C. Correct arc length D. Welding speed
V. Which electrode to use	A. Electrode types B. Number code - color code 1. metal to be welded 2. kind of weld 3. type of welding machine 4. thicknessof metal 5. strength of weld
VI. How to set welder amperage	A. Electrode used B. Metal thickness C. Commonsense
VII. Kind of welds	A. Butt welds B. Fillet welds C. Lap welds 1. tacking 2. single pass 3. double pass
VIII. Cutting and piercing holes	A. Maximum setting B. Long arc C. Sawing motion D. Pushing electrode through E. circle a long until desired diameter is reached

	TEACHING POINTS
IX. Welding cast iron	A. Preheating
	B. One-half inch at a time
	C. Electrode choice
	D. Penetration
X. Hardsurfacing	A. Theory of hardsurface
	B. Electrode used
	C. Material preparation
	D. Positioning
	E. The technique applied
	F. Backstepping
	G. Use of hardsurfacing powder
XI. Other welding problems	A. Welding stainless steel
	B. Cast iron to mild steel
	C. Stainless steel to mild steel
	D. Medium to high carbon steel
	E. Sheet metal welding
XII. Welding out of position	A. Vertical up
	B. Vertical down
	C. Overhead
XIII. Other welder uses	A. Brazing
	B. Soldering
	C. Removal of rusty nuts and bolts

RELATED BIOLOGY - OBJECTIVES

This course is planned to give the student of agriculture a basic knowledge of Botany and Zoology. The students should be required to learn the classification of animals and plants - their parts and the function of each.

As far as possible this work should be related to the courses in agriculture the pupils will be studying at the time.

In the Fall material is brought in to the classroom from the field trips of the various classes and used as a part of the study program.

PART I

STUDY OF PLANT LIFE

Unit I. Physical Environment of Plant and Animal Life

- A. Air
  - 1. General description of the atmosphere
  - 2. Explanation of the importance of air to plants and animals
- B. Water
  - 1. General discussion of the water cycle
  - 2. Brief explanation of the importance of water to plants and animals
- C. Soil
  - 1. General discussion of the origin and composition of soil
  - 2. Detailed description of the types of soils
  - 3. General explanation of the methods of soil and conservation
- D. Heat
  - 1. Brief discussion of the sun as the source of heat
  - 2. Brief explanation of seasonal and climatic variations in temperature
  - 3. General discussion of the importance of heat to plants and animals

Unit II. Study of Flowers

- A. Study of a typical flower
  - 1. Materials - nasturtium and petunia
  - 2. Parts of the flower
    - a. Calyx - sepals
    - b. Corolla - petals

- c. Essential organs
  - (1) Stamen
    - (a) Filament
    - (b) Anther
    - (c) Pollen
  - (2) Pistil
    - (a) Ovary - ovule
    - (b) Style
    - (c) Stigma
- 3. Function of each part

B. Study of an Inconspicuous Flowering Plant

- 1. Material - corn
- 2. Flowering parts of the plant
  - a. Tassel - collection of staminate flowers
    - (1) Bract
    - (2) Filament
    - (3) Anther
  - b. Ear of corn - collection of pistillate flowers
    - (1) Husk
    - (2) Kernel - ovary
    - (3) Silk - style and stigma

C. Development of the Seed

- 1. Pollination
  - a. Types of pollination
    - (1) Self-pollination
    - (2) Cross-pollination

        - (3) Artificial pollination
      - b. Value of each type of pollination
      - c. Natural devices for encouraging cross-pollination
      - d. Agents of pollination
      - e. Discussion of related topics
        - (1) Hybrids
        - (2) Mutants
        - (3) Hay fever
  - 2. Pollen grain
    - a. Tube nucleus
    - b. Generative nucleus
      - (1) First sperm nucleus
      - (2) Second sperm nucleus
  - 3. Ovule
    - a. Egg nucleus
    - b. Two polar nuclei
  - 4. Fertilization
    - a. Embryo

      Result of union of egg and first sperm nucleus

    - b. Endosperm

      Union of two polar nuclei and the second sperm nucleus

    - c. Seed

      Embryo and the endosperm material

- D. Study of the Seed
  - 1. Dicotyledonous seed

    - a. Material - bean seed
    - b. External structures
        - (1) Testa
        - (2) Hilum
        - (3) Micropyle
    - c. Internal structures
        - (1) Plumule
        - (2) Hypocotyl
        - (3) Cotyledons
- 2. Monocotyledonous seed
    - a. Material - corn seed
    - b. External structures
        - (1) Integument
        - (2) Endosperm
        - (3) Embryo
    - c. Internal structures
        - (1) Endosperm
        - (2) Cotyledon
        - (3) Hypocotyl
- 3. Conditions essential for germination
- 4. Importance of seeds
    - a. To the plant
    - b. To man
- 5. Methods of seed dispersal

E. Study of Fruits

1. Material - green tomato and bean pod
2. Parts of a fruit
    a. External structures
        (1) Protective covering
        (2) Accessory structures
    b. Internal structures
        (1) Seeds
        (2) Funiculus
        (3) Placenta
        (4) Ovary wall
3. Types of fruits
4. Importance of fruits
    a. To the plant
    b. To man
5. Methods of fruit dispersal

Unit III Study of the Cell

A. Parts of a Cell

1. Plant cell
    a. Protoplasm
        (1) Nucleus
            (a) Nucleolus
            (b) Chromatin - chromosome
        (2) Cytoplasm
        (3) Plasma or cell membrane
    b. Plastids

c. Inclusions

(1) Vacuoles - cell sap

(2) Nonliving material

d. Cell wall

2. Animal cell

a. Protoplasm

(1) Nucleus

(2) Cytoplasm

(3) Plasma or cell membrane

b. Inclusions

B. Functions of the Parts of a Cell

1. Nucleus

Regulates inheritance, reproduction, and cell activity

2. Cytoplasm

Fills the cell and contains material vital to the cell

3. Plasma or cell membrane

a. Definition

Outer edge of cytoplasm which binds the cell and determines what will pass in and out of the cell

b. Explanation

(1) Types of diffusion

(a) Introduction

1- Discussion of molecular motion

2- Explanation of the difference between more concentrated and less concentrated solutions

- (b) Simple diffusion
    - 1- Definition
    - 2- Experiments
        - a- Sugar in water
        - b- Copper sulfate crystals in water
        - c- Expose a bottle of ammonium hydroxide
- (c) Osmosis
    - 1- Definition
    - 2- Experiments
        - a- Pick the shell from a small area at both ends of an egg and gently insert a small-bore glass tube which is about 3 feet long through the membrane at one end. Seal the tube to the egg with wax and insert the egg into a jar of water. Support the tube with an iron stand.
        - b- Place molasses in the bowl of a thistle tube. Cover the mouth of the bowl with a semi-permeable membrane. Invert the bowl in a jar of water.
        - c- Hollow out the inside part of a carrot. Fill the hollow with molasses. Place a small-bore glass tube which is about 3 feet long through a stopper which fits the opening in the carrot and place the stopper in the carrot. Insert the carrot in a jar of water and support the tube with an iron stand.

(2) Importance

- (a) Turgor
    - 1- Definition
    - 2- Experiments
        - a- Place a piece of peeled potato in water

(b) Plasmolysis

1- Definition

2- Experiments

a- Place a piece of peeled potato in salt solution

NOTE: These experiments on turgor and plasmolysis are done together

b- Conduction

4. Cell wall

Nonliving cellulose which gives shape and protection to the cell

C. Characteristics of Cells

1. Chemical composition of protoplasm

2. Physical properties of protoplasm

3. Physiological functions of cells

a. Ingestion

b. Digestion

c. Absorption

d. Assimilation

e. Respiration

f. Excretion

g. Secretion

h. Motion

i. Sensitivity

j. Reproduction

Unit IV Study of Leaves

A. External Structure of a Leaf

1. Parts

   a. Blade - simple and compound

   b. Veins - midrib

   c. Petiole

   d. Stipules

   e. Sheath

   f. Ligule

2. Venation

   a. Parallel

   b. Netted

      (1) Palmate

      (2) Pinnate

3. Modified leaves

B. Microscopic Structure of a Leaf

1. Epidermis

   a. Material - lower epidermis of a leaf from a narcissus, sweet william, tradescantia, or geranium plant

   b. Structures

      (1) Epidermal cells

      (2) Guard cells - chloroplasts

      (3) Stomates

2. Cross section

   a. Material - cross section of a leaf of an English ivy or sweet william plant. Roll the leaf and cut very thin slices with a wet razor blade which is sharp

   b. Structures

      (1) Upper epidermis with guard cells and stomates

      (2) Palisade tissue - chloroplasts

        - (3) Spongy tissue - chloroplasts
            - (a) Air spaces
            - (b) Veins
        - (4) Lower epidermis - guard cells and stomates

C. Activities in the Leaf

1. Respiration

    a. Experiment - Place a quantity of tradescantia in a flask with a small amount of water. Use a two-holed rubber stopper with a thistle tube and a right angle bend to which is attached a rubber tube. The rubber tube should be clamped and the thistle tube should be sealed by the water at the bottom of the glass flask. After twenty-four hours in the dark, pour some water into the thistle tube and allow the gas in the flask to escape from the rubber tube and bubble into some limewater.

    b. Definition of respiration

    c. Value of respiration

2. Photosynthesis

    a. Experiments

        (1) Place some healthy green leaves in a glass flask filled with water through which carbon dioxide has been bubbled. Use a one-holed rubber stopper with a funnel. Stopper the flask and adjust the funnel so that it barely extends beyond the stopper into the water in the flask. Fill a small test tube with water and invert it in the funnel which has been filled with water. Stand the set up in the sunlight until the test tube is filled with gas. Test the gas with a glowing splint.

        (2) Partly cover a geranium leaf and place the plant in the sun for several hours. Uncover the leaf and remove it from the plant. Boil the leaf in alcohol until colorless; dip it in boiling water; and cover it with iodine.

        (3) Remove a variegated leaf from a coleus plant which has been in the sun for several hours. Boil the leaf in alcohol; dip it in boiling water; and cover it with iodine. Be sure that the leaf is the same color on both sides. It must show pink or yellow on both surfaces.

(4) Partly cover the under surface of a geranium leaf with vaseline. After the plant has been several hours in the sun, take the leaf from the plant and remove the vaseline. Boil the leaf in alcohol until colorless; dip it in hot water; and cover it with iodine.

b. Definition of photosynthesis

c. Conditions essential for photosynthesis

d. Relation between sugar and starch in plants

e. Equations

(1) $6CO_2 + 6H_2O + \text{energy} \longrightarrow C_6H_{12}O_6 + 6O_2$

(2) $C_6H_{12}O_6 \rightleftharpoons C_6H_{10}O_5 + H_2O$

f. Relations between carbohydrates and fats and proteins

g. Importance of photosynthesis

3. Transpiration

a. Experiments

(1) Place a dry test tube over a healthy green leaf and place the plant in the sunlight for several hours. The test tube should be placed so that the mouth of the tube is in the up position.

(2) Cover a leaf with filter paper which has been stained with cobalt chloride and place the plant in the sunlight for several hours. The cobalt chloride paper and the leaf should be placed between two glass slides to keep the paper from drying.

b. Definition of transpiration

c. Value of transpiration

4. Abscission

5. Autumn coloration

D. Economic Importance of Leaves

Unit V Study of Stems

- A. Structure of Stems
  - 1. Monocotyledonous stem
    - a. External structure
      - (1) Material - corn
      - (2) Parts
        - (a) Node
        - (b) Internode
        - (c) Rind
    - b. Internal structure
      - (1) Material - cross section of corn stem
      - (2) Parts
        - (a) Fibrovascular bundle
          - 1- Xylem
          - 2- Phloem
        - (b) Pith
        - (c) Rind
      - (3) Function of each part
  - 2. Dicotyledonous stem
    - a. External structure
      - (1) Material - horse chestnut, lilac, or maple twig
      - (2) Parts
        - (a) Lenticel
        - (b) Leaf scar
        - (c) Vascular bundle scar

- (d) Bud scale scar
- (e) Flower scar
- (f) Terminal bud
- (g) Lateral bud
- (h) Bark

(3) Function of each part

b. Internal structure of a young herbaceous stem

(1) Material - cross section of begonia and celery stems

(2) Parts

- (a) Epidermis
- (b) Cortex
- (c) Vascular bundle
    - 1- Phloem
        - a- Sieve tubes
        - b- Bast fibers
    - 2- Cambium
    - 3- Xylem
        - a- Tracheids and vessels
        - b- Wood fibers
- (d) Pith

(3) Function of each part

c. Internal structure of an older stem

(1) Material - basswood

(2) Parts

- (a) Bark
- (b) Cortex

                (c) Phloem
                (d) Cambium
                (e) Xylem
                    1- Spring wood
                    2- Summer wood
                    3- Annual rings
                (f) Pith
                (g) Vascular rays
                (h) Heart and sap wood
            (3) Function of each part
            (4) Economic values of wood
                (a) Types of grains in wood
                (b) Types of wood in furniture
                    1- Solid
                    2- Veneer
                    3- Stained
                (c) Uses for hard and soft woods

B. Functions of Stems

1. Conduction
2. Support - photogropism
3. Storage
4. Manufacture of food
5. Vegetative reproduction
    a. Stem cutting
    b. Layering
    c. Grafting

C. Modified Stems

D. Trees and Shrubs

  1. Identification of common trees and shrubs

  2. Factors in selection of trees for planting

    a. Ornamental value

    b. Shade value

    c. Growth requirements

  3. Care of trees and shrubs

    a. Tree surgery - pruning

    b. Insect control

  4. Economic values of trees

    a. Protection and regulation of water supply

    b. Control of erosion

    c. Uses of wood

    d. Value of forest by-products

  5. Destructive factors in forest areas

    a. Fires

    b. Inefficient methods of lumbering

    c. Insects

    d. Fungi

  6. Methods of protecting and conserving forests

Unit VI Study of Roots

A. Gross Structure of a Root

  1. Material - carrots or parsnips

  2. Parts

a. External structure

(1) Primary root

(2) Secondary root

(3) Epidermis

b. Internal structure

(1) Central cylinder

(2) Cortex

Stain a cross section which has been boiled in water with iodine

(3) Epidermis

(4) Secondary roots

3. Function of each part

B. Microscopic Structure of a Root

1. Materials

a. Radish seedlings

Plant on moist blotting paper in Petri dishes and keep in a dark place for about five days

b. Timothy grass seedlings

Scatter the seeds on the surface of a dish of water and examine under the microscope after about seven days.

c. Corn seedlings

Grow on moist blotting paper in Petri dishes and examine after they have been in a dark place for about five days.

2. Parts

a. Radish seedlings

(1) Primary roots

(2) Secondary roots

        - (3) Root hairs
        - (4) Root tip
    - 3. Function of the parts
- C. Function of Roots
    - 1. Absorption
    - 2. Conduction
    - 3. Anchorage
    - 4. Storage
    - 5. Propagation
- D. Types of Roots
    - 1. Aerial
    - 2. Aquatic
    - 3. Soil
        - a. Normal
            - (1) Tap
            - (2) Fleshy
            - (3) Fibrous
        - b. Adventitious
            - (1) Brace
            - (2) Climbing
            - (3) Parasitic
- E. Tropisms
- F. Economic Value of Roots
    - 1. Flood control
    - 2. Soil conservation

3. Essential by-products

a. Foods

b. Drugs

c. Dyes

Unit VII Genetics

A. Cell Nucleus

1. Nuclear - membrane

2. Nucleoplasm

3. Chromosome - genes

B. Cell Division

1. Mitosis

2. Meiosis

a. Formation of gametes (Gametogenesis)

(1) Egg cell (Oogenesis)

(2) Sperm cell (Spermatogenesis)

b. Explanation of diploid and haploid numbers

c. Explanation of sex determination

C. Fertilization

D. Principles of Heredity

1. Life of Gregor Mendel

2. Mendelian Laws

a. Dominant and recessive traits

b. Unit characters

c. Character independence

d. Segregation of characters

- 3. Study of offspring
    - a. F_1 generation
        - (1) Monohybrids
        - (2) Dihybrids
    - b. F_2 generation
        - (1) Monohybrids
        - (2) Dihybrids
    - c. Blending inheritance
    - d. Sex-linked characteristics

Unit VIII Classification of Plants

- A. Thallophytes - plants which have no root, stem or leaf
    - 1. Fungi - no chlorophyll
        - a. Bacteria
        - b. Yeast
        - c. Molds
        - d. Mushrooms
        - e. Rusts and smuts
    - 2. Algae - chlorophyll
        - a. Seaweeds
        - b. Minute aquatic plants
            - (1) Diatoms
            - (2) Spirogyra
- B. Bryophytes - plants which have stems and simple leaves
    - 1. Liverworts
    - 2. Mosses

C. Pteridophytes - plants which have roots, stems, leaves and vascular system

  1. Ferns

  2. Horsetails

  3. Club mosses

D. Spermatophytes - plants which have roots, stems, leaves and bear seeds

  1. Gymnosperms

  2. Angiosperms

    a. Monocotyledons

    b. Dicotyledons

Unit IX Study of Thallophytes

A. Algae

  1. Spirogyra

    a. Habitat

      Free-floating filamentous fresh water alga - "pond scum"

    b. Parts

      (1) Cell wall

      (2) Cell membrane

      (3) Cytoplasm

      (4) Chloroplast - ribbon-like structure

      (5) Pyrenoids

      (6) Nucleus

    c. Reproduction

      (1) Asexual - cell division

      (2) Sexual - conjugation

(a) Gametes

(b) Zygospores

2. Economic importance of algae

B. Fungi

1. Bread mold

a. Preparation of material

Place a piece of moistened bread which has been exposed to dust in a Petri dish and put the covered dish in a warm place for about a week. Enough Petri dishes should be prepared for individual student work.

b. Conditions of growth

c. Study of structure - hand lens and microscope

(1) Mycelium

(a) Nutritive hypha - rhizoid

(b) Vegetative hypha - stolon

(c) Reproductive hypha - Sporoangiophore

(2) Sporangium

(a) Columella

(b) Spores

d. Effect on sustaining material

Chemical reaction of enzymes on starch

e. Economic importance of molds

(1) Source of drugs

(2) Flavoring of foods

(3) Destruction of materials

(4) Cause of diseases

2. Bacteria
    a. Conditions for growth
        (1) Natural requirements
        (2) Culture media
            (a) Containers - test tubes and Petri dishes
            (b) Media - agar beef broth
            (c) Sterilization
                1- Dry or moist heat
                2- Continuous or intermittent heat
            (d) Types
                1- Mixed cultures
                2- Pure cultures
            (e) Procedure
                1- Inoculation
                2- Controls
    b. Study of structure
    c. Forms of bacteria
        (1) Coccus
        (2) Bacillus
        (3) Spirillum
    d. Types of bacteria
        (1) Parasitic
        (2) Saprophytic
    e. Method of reproduction

f. Beneficial action of bacteria
    (1) Making vinegar - acetic acid
    (2) Making butter and cheese
    (3) Tanning leather
    (4) Preparing flax for linen
    (5) Improving agriculture
        (a) Decay
        (b) Nitrogen fixation
        (c) Nitrifying bacteria
        (d) Denitrifying bacteria
        (e) Nitrogen cycle

g. Harmful action of bacteria
    (1) Souring of milk
    (2) Food spoilage
    (3) Plant diseases
    (4) Human diseases

h. Bacteria and human diseases
    (1) Infectious and non-infectious disease
    (2) Means of transfer from sick person
        (a) Discharges from nose and mouth
        (b) Discharges from intestines
        (c) Discharges from open sores
    (3) Means of transfer to well person
        (a) Nasal passages and mouth
        (b) Breaks in the skin

- (4) Harm done by bacteria in the body
    - (a) Formation of obstructions
    - (b) Destruction of tissue
    - (c) Formation of toxins
- (5) Defenses of the body
    - (a) Unbroken skin and mucous membrane
    - (b) White corpuscles aided by other blood factors
    - (c) Formation of antitoxins
- (6) Immunity
    - (a) Definition
    - (b) Types
        - 1- Natural - inform or inherited
        - 2- Acquired
            - a- Active
            - b- Passive

i. Methods of control

- (1) Heat
    - (a) Pasteurization
    - (b) Sterilization
- (2) Cold
    - (a) Refrigeration
    - (b) Deep freeze
- (3) Dehydration
- (4) Chemicals
    - (a) Preservatives
    - (b) Disinfectants

            - (c) Antiseptics
        - (5) Personal good health
    - j. Non-bacterial diseases common to the human body
        - (1) Heart diseases
        - (2) Cancer
        - (3) Degenerative diseases
        - (4) Poliomyelitis
    - k. Community health organizations
        - (1) Federal health agencies
        - (2) State Health Department
        - (3) City Health Department
        - (4) Private agencies

Unit X Study of Bryophytes - Mosses

- A. Habitat
- B. Structure
    - 1. Gametophyte
        - a. Rhizoids
        - b. Stem and leaves
        - c. Reproductive structures
            - (1) Antheridium
            - (2) Archegonium
    - 2. Sporophyte
        - a. Seta
        - b. Calyptra
        - c. Capsule
        - d. Operculum

        - e. Spores
- C. Life Cycle
    - 1. Alternation of generations
    - 2. Sporophyte

        Spores form the protonema
    - 3. Gametophyte
        - a. Antheridium
        - b. Archegonium
        - c. Fertilization of egg
        - d. Development of zygote
- D. Economic Importance of Mosses

Unit XI Study of Pteridophytes - Ferns

- A. Habitat
- B. Structure
    - 1. Gametophyte - prothallium
        - a. Rhizoids
        - b. Antheridium
        - c. Archegonium
        - d. Heart-shaped green plate of cells
    - 2. Sporophyte
        - a. Rhizome
        - b. Adventitious roots
        - c. Frond
        - d. Sorus
        - e. Sporangium - spores

C. Life Cycle

  1. Alternation of generations
  2. Sporophyte

     Spores develop into prothallia

  3. Gametophyte
     a. Antheridium
     b. Archegonium
     c. Fertilization of egg
     d. Development of zygote

D. Economic Importance of Ferns

PART II

STUDY OF ANIMAL LIFE

Unit I Classification of animals

A. Protozoa

One celled animals

B. Metazoa

1. Porifera

Porous body - sponges

2. Coelenterata

Soft body with single opening to body cavity and tentacles
Hydra and jellyfishes

3. Platyhelminthes

Flatworms - tapeworms and liver fluke

4. Nemathelminthes

Roundworms - hookworms and trichinella

5. Annelida

Segmented worms - earthworms, sandworms, and leeches

6. Mollusca

Soft body usually with shells - clams, oysters, scallops, snails, and squids

7. Echinodermata

Spiny skin, water-vascular system, radial symmetry - starfishes, sea urchins and sand dollars

8. Arthropoda

a. Crustacea

Five pair of legs, two body regions, gills - crayfish, lobsters and crabs

b. Insecta

Three pair of legs, three body regions, tracheae - insects

c. Arachnida

Four pair of legs, two body regions, lung books - spiders, mites and ticks

d. Myriapoda

Many pair of legs, many segments, least specialized arthropod - centipedes and millipedes

9. Chorodata

a. Pisces

Slimy skin and usually possess scales and gills - fishes

b. Amphibia

Young breathe by gills, adult by lungs - frogs and toads

c. Reptilia

Scaly skin, lungs - turtles, lizards, and snakes

d. Aves

Warm-blooded, feathered and lungs - birds

e. Mammalia

Warm-blooded, lungs, young nourished by milk, some hair covering the body - duckbills, kangaroos, bats, squirrels, rabbits, cats, whales, elephants, horses, cows, monkeys, and man

Unit II Study of Protozoa

A. Study of Amoeba (Amoeba proteus or Amoeba dubia)

1. Habitat

2. Structure
    a. Nucleus
    b. Cytoplasm
    c. Cell membrane
    d. Pseudopodia
    e. Food vacuoles
    f. Contractile vacuole
3. Functions
    a. Locomotion
    b. Ingestion
    c. Digestion
    d. Assimilation
    e. Respiration
    f. Excretion
    g. Reproduction

B. Study of Paramecium (Paramecium caudatum)
  1. Habitat
  2. Structure
    a. Nucleus
    b. Cytoplasm
    c. Cell membrane
    d. Cilia
    e. Trichocysts
    f. Oral groove
    g. Gullet
    h. Anal pore

        - i. Contractile vacuoles
        - j. Food vacuoles
    - 3. Functions
        - a. Locomotion
        - b. Ingestion
        - c. Digestion
        - d. Assimilation
        - e. Respiration
        - f. Excretion
        - g. Reproduction
            - (1) Fission
            - (2) Conjugation
- C. Economic Importance of Protozoa
    - 1. Amoebic dysentery
    - 2. Sleeping sickness

        Tsetse fly - Trypanosoma
    - 3. Malaria

        Anopheles mosquito - Sporozoa

Unit III Study of Metazoa

- A. Porifera - Grantia
    - 1. Habitat
    - 2. Structure
        - a. Osculum
        - b. Flagella
        - c. Pores
        - d. Spicules

        - e. Central cavity
    - 3. Functions
        - a. Ingestion
        - b. Respiration
        - c. Reproduction
            - (1) Asexual - budding
            - (2) Sexual
    - 4. Economic importance
- B. Coelenterata - Hydra
    - 1. Habitat
    - 2. Structure
        - a. Tentacles
        - b. Stinging capsules
        - c. Mouth
        - d. Ectoderm
        - e. Endoderm
        - f. Cavity
        - g. Basal disk
        - h. Reproductive organs
            - (1) Ovaries
            - (2) Testes
    - 3. Functions
        - a. Locomotion
        - b. Ingestion
        - c. Digestion
        - d. Excretion

        - e. Reproduction
            - (1) Asexual
            - (2) Sexual
    - 4. Related animals
        - a. Jellyfishes
        - b. Sea anemones
        - c. Coral polyps
        - d. Sea fans
    - 5. Economic importance
- C. Platyhelminthes - Tapeworm (Taenia solium)
    - 1. Habitat
    - 2. Structure
        - a. Head
            - (1) Suckers
            - (2) Hooks
        - b. Segments
    - 3. Life cycle
        - a. Animal host
        - b. Human host
    - 4. Economic importance
    - 5. Methods of control
- D. Nemathelminthes
    - 1. Porkworm (Trichinella spiralis)
        - a. Life cycle
            - (1) Animal host
            - (2) Human host

        b. Methods of control

    2. Hookworm (Necator americanus)

        a. Life cycle

        b. Economic importance

        c. Methods of control

E. Annelida - Earthworm (Lumbricus terrestris)

    1. Habitat

    2. Structure

        a. Upper lip

        b. Mouth

        c. Segments

        d. Setae

        e. Mephridia

        f. Oviducts

        g. Sperm ducts

        h. Clithellum

        i. Anus

    3. Functions

        a. Locomotion

        b. Ingestion

        c. Digestion

        d. Excretion

        e. Respiration

        f. Circulation

        g. Nervous system

        h. Reproduction

        - i. Regeneration
    - 4. Related animals
        - Leech
    - 5. Economic importance
- F. Echinodermata - Starfish (Asterias forbesi)
    - 1. Habitat
    - 2. Structure
        - a. Rays
        - b. Spines
        - c. Tube feet
        - d. Eye spots
        - e. Anus
        - f. Sieve plate
        - g. Mouth
    - 3. Regeneration
    - 4. Related animals
        - a. Sand dollar
        - b. Sea urchin
    - 5. Economic importance
- G. Mollusca - Clam (Venus mercenaria or Myra arenaria)
    - 1. Habitat
    - 2. Structure
        - a. Siphons
        - b. Gills
        - c. Mouth
        - d. Foot

      - e. Shells
        - (1) Lines of growth
        - (2) Muscular attachments
  - 3. Related Animals
    - a. Univalves - snails and abalone
    - b. Bivalves - oyster and scallop
    - c. Valveless - octopus and squid

H. Arthropoda

- 1. General characteristics
- 2. Crustacea - Crayfish (Cambarus)
  - a. Habitat
  - b. Structures
    - (1) Claws
    - (2) Antennae
    - (3) Antennules
    - (4) Compound eyes
    - (5) Cephalothorax
    - (6) Appendages
    - (7) Abdomen
    - (8) Telson
  - c. Functions
    - (1) Locomotion
    - (2) Food-getting
    - (3) Respiration
    - (4) Reproduction
      - Life history

- d. Related animals
    - Lobster - crab - shrimp
- e. Economic importance

3. Insecta
    - a. Types of insects
        - (1) Grasshopper (Romalae)
            - (a) Habitat
            - (b) Structure
                - 1- Head - thorax - abdomen
                - 2- Antennae
                - 3- Simple eyes
                - 4- Compound eyes
                - 5- Palpi
                - 6- Appendages
                - 7- Tympanic membranes
                - 8- Spiracles
                - 9- Ovipositor
            - (c) Functions
                - 1- Locomotion
                - 2- Food-getting
                - 3- Sense organs
                - 4- Respiration
                - 5- Reproduction
                    - Life history
            - (d) Methods of control

(e) Related animals

Cricket - roach - walking stick -
praying mantis

(f) Economic Importance

(2) Moths and butterflies

(a) Characteristics of each

(b) LLife histories of common moths

1- Codling moth

2- Clothes moth

3- Gypsy moth

4- Silkworm

(c) Life histories of common butterflies

1- Cabbage butterfly

2- Viceroy butterfly

3- Monarch butterfly

4- Swallow -tail butterflies

(d) Economic importance

(3) Bees

(a) Life history

(b) Economic importance

(4) House fly (Musca domestica)

(a) Life history

(b) Methods of control

(c) Economic importance

(5) Mosquito (Culex)

(a) Life history

(b) Methods of control

(c) Economic importance

(d) Related mosquitoes

1- Anopheles - malaria

2- Aedes - yellow fever

b. Economic importance of other insects

(1) Beneficial

(2) Harmful

c. Methods of control of other insects

I. Chordata (Subphylum Vertebrata)

1. Pisces

a. General characteristics

b. External structure of the yellow perch (Perca flavescens)

(1) Mouth

(2) Nostrils

(3) Eyes

(4) Gill slits

(5) Fins

(6) Scales

(7) Lateral lines

(8) Anus

c. Life history

d. Economic importance of the class

2. Amphibia

a. General characteristics of the class

b. Study of the frog (Rana pipiens)

- (1) External structure
  - (a) Mouth
  - (b) Nostrils
  - (c) Eyes
  - (d) Tympanum
  - (e) Appendages
  - (f) Anus
  - (g) Skin - protective coloration
- (2) Internal structure and function of each part
  - (a) Locomotion
    - Muscles
  - (b) Ingestion
    - Special adaptation of tongue
  - (c) Digestion
    - 1- Mouth
    - 2- Esophagus
    - 3- Stomach
    - 4- Intestine
      - a- Liver
      - b- Pancreas
    - 5- Rectum
  - (d) Circulation
    - 1- Heart
    - 2- Blood vessels
    - 3- Blood

            - (e) Respiration
                - 1- Nostrils
                - 2- Mouth
                - 3- Lungs
                - 4- Skin
            - (f) Nervous system
                - 1- Brain
                - 2- Spinal cord
            - (g) Excretion
                - 1- Kidneys
                - 2- Bladder
                - 3- Lungs
                - 4- Skin
            - (h) Reproduction
                - 1- Female reproductive organs
                - 2- Male reproductive organs
                - 3- Life history
    - c. Economic importance of the class
- 3. Reptilia
    - a. General characteristics of the class
    - b. Study of snakes
        - (1) Head structure
            - (a) Nostrils
            - (b) Teeth
            - (c) Tongue
            - (d) Poison glands

            (e) Fangs
        (2) Food habits
        (3) Examples of non-poisonous snakes
        (4) Examples of poisonous snakes
        (5) First aid treatment for snakebite
    c. Related animals
            Lizards - alligators - crocodiles - turtles
    d. Economic importance of the class
4. Aves
    a. General characteristics of the class
    b. Study of the external structure
        (1) Types of feathers
        (2) Types of wings
        (3) Types of feet
        (4) Types of beaks
    c. Life histories of some common birds
    d. Bird study
        (1) Habitats and nests
        (2) Migration habits
        (3) Bird protection
    e. Economic importance of the class

RELATED MATHEMATICS

GRADE IX

Objectives:

1. To impart an understanding of the development and structure of the subject of mathematics
2. To train the student in the analysis of problems and in the application of mathematical processes to their solution
3. To teach the method of solution of all types of mathematical problems connected with the many branches of agriculture

September

I. Inventory Tests

Refresher Arithmetic
Stein - Part I
Pages 11 - 50

- A. Addition
- B. Subtraction
- C. Multiplication
- D. Division
- E. Addition of fractions
- F. Subtraction of fractions
- G. Multiplication of fractions
- H. Division of fractions

II. Practical Agricultural Problems

Modern Agricultural Mathematics M. Nadler - Special Arithmetic

- A. Addition, subtraction, multiplication, and division
- B. Addition, subtraction, multiplication, and division of fractions

October

III. Common Fractions

- A. Reducing fractions to lowest terms
- B. Changing improper fractions
- C. Reduction of mixed numbers
- D. Finding lowest common denominator and changing fractions to equivalent fractions
- E. Addition of fractions and mixed numbers
- F. Borrowing in subtraction of fractions
- G. Multiplication and division of mixed numbers and fractions
- H. Finding what part one number is of another

IV. Decimal Fractions — Pages 105 - 164

- A. Addition and subtraction of decimals
- B. Multiplication and division of decimals
- C. Changing common fractions to decimals
- D. Short methods in multiplication and division

November

V. Conversion and Practical Application of Measurements — Pages 207 - 243

- A. Measurement of length
- B. Measurement of areas
  - 1. Quadrilaterals
  - 2. Triangles

C. Practical land measurement

  1. Measurement of fields of irregular shape

  2. Measurement of square fields

  3. Problems in square numbers

  4. Extracting the square roots of numbers

December

VI. Application of measurements - continued

A. Finding the number of plants per acre

B. Finding the number of trees per acre in the hexagonal system

C. Finding the number of bushes per acre

D. Measurement of volume

  1. Conversion of measurements of volume

  2. Find the volume of rectangles, solids, cubes, cylinders, spheres, cones, and pyramids

E. Measurement of cord wood — Pages 64 - 65

F. Measure of circular and cylindrical objects — Pages 66 - 79

  1. Computing the circumference, diameter and area of circles

  2. Finding the volumes of cylinders

        3. Computing the capacities of cylindrical silos

    G. Liquid Measurements

    H. Measurement of lumber and timber — Pages 89 - 100

        1. Computing number of board feet

        2. Computing cost of lumber in board feet

        3. Measuring the content of logs in board feet

January

VII. Right Triangles — Pages 117 - 123

    A. Rule of the right triangle

    B. Computing the length of the legs and hypotenuse

    C. Review of extracting square root

VIII. Percentage — Pages 195 - 197
Pages 124 - 130

    A. Meaning of per cent

    B. Changing per cent to decimals

    C. Changing decimals to per cent

    D. Changing per cent to common fractions

    E. Changing common fractions to per cent

    F. Practice in computing percentage

    G. Practice in finding what per cent one number is of another

- H. Finding a number when a certain per cent of it is given
- I. General review of percentage Problems in agriculture
  - 1. Fertilizers, butterfat per cents, and feeds

February

- IX. Farm Finances — Pages 238 - 245
  - A. Simple interest
  - B. Compound interest — Pages 271 - 273
  - C. Interest formulas — Page 238
  - D. Computing interest on mortgages
  - E. Computing rate of interest
    - 1. Feed
    - 2. Installment buying
    - 3. Loans
  - F. Taxes and insurance
- X. Capacity - Dry Measure
- XI. Measurement of weights avoirdupois
- XII. Measure of Time

March

- XIII. Business Management of Farming — Pages 246 - 256
  - A. Inventories
  - B. Net income and net farm profit
  - C. Labor income

  D. Return on capital

  E. Income taxes - federal and state

XIV. Graphs

Pages 228 - 229
Pages 258 - 263

  A. Bar graph

  B. Broken line graphs

  C. Circle graphs

April

XV. Farm maneuvers and fertilizers

Pages 196 - 210

  A. Quantity of maneuvers produced by farm animals

  B. Value of farm maneuvers

  C. Mixed fertilizers and problems

  D. Amounts of elements in commercial fertilizers

  E. Composition and cost of commercial fertilizers

XVI. Farm Power and Mechanics

Pages 213 - 227

  A. Problems in work and horsepower

  B. Problems in watts and kilowatts

  C. Problems in cost of electrical service

  D. Computing monthly bills for electricity

May

XVII. Unit Reviews

Refresher Review -
Pages 367 - 377

  A. Whole numbers

B. Common fractions

C. Decimal fractions

D. Per cents

E. Square and square roots

F. Basic units of measure

  1. Linear

  2. Perimeter and circumference

  3. Areas

  4. Volumes

G. Mixed maintenance drills

H. Review problems

June

Summer employment

RELATED MATHEMATICS - GRADE IX

References:

1. Refresher Arithmetic - Stein Allyn and Bacon

2. Modern Agricultural Mathematics

   Nadler - Orange - Judd